

**NASA INFRASTRUCTURE:
ENABLING DISCOVERY AND
ENSURING CAPABILITY**

HEARING
BEFORE THE
SUBCOMMITTEE ON SPACE
COMMITTEE ON SCIENCE, SPACE, AND
TECHNOLOGY
HOUSE OF REPRESENTATIVES
ONE HUNDRED THIRTEENTH CONGRESS
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CONTENTS

September 20, 2013

Witness List	Page 2
Hearing Charter	3

Opening Statements

Statement by Representative Steven Palazzo, Chairman, Subcommittee on Space, Committee on Science, Space, and Technology, U.S. House of Rep- resentatives	26
Written Statement	27
Statement by Representative Julie Brownley, Acting Ranking Minority Mem- ber, Subcommittee on Space, Committee on Science, Space, and Technology, U.S. House of Representatives	28
Written Statement	29

Witnesses:

The Honorable Paul K. Martin, Inspector General, National Aeronautics and Space Administration	30
Oral Statement	32
Written Statement	32
Mr. Richard Keegan, Associate Deputy Administrator, National Aeronautics and Space Administration	40
Oral Statement	42
Written Statement	42
Discussion	49

Appendix I: Answers to Post-Hearing Questions

The Honorable Paul K. Martin, Inspector General, National Aeronautics and Space Administration	68
Mr. Richard Keegan, Associate Deputy Administrator, National Aeronautics and Space Administration	84

Appendix II: Additional Material for the Record

Submitted statement of Representative Donna F. Edwards, Ranking Member, Subcommittee on Space, Committee on Science, Space, and Technology	114
Submitted statement of Representative Eddie Bernice Johnson, Ranking Member, Committee on Science, Space, and Technology	116
Agency/MPCV Risk: Inability to Certify TPS Performance presentation, sub- mitted by Representative Steve Stockman, Committee on Science, Space, and Technology, U.S. House of Representatives	117
Safety and Mission Assurance concerns related to the closure of the JSC Arc Jet Facility letter, submitted by Representative Steve Stockman, Com- mittee on Science, Space, and Technology, U.S. House of Representatives	158
Update on Closure of the JSC Arc Jet Facility and National Security Con- cerns letter, submitted by Representative Steve Stockman, Committee on Science, Space, and Technology, U.S. House of Representatives	161

IV

	Page
NASA, Ames Research Center's Justification for Other than Full and Open Competition document, submitted by Representative Steve Stockman, Committee on Science, Space, and Technology, U.S. House of Representatives	165
Letter submitted by Representative Bill Posey, Committee on Science, Space, and Technology, U.S. House of Representatives	170
Letter submitted by Representative Bill Posey, Committee on Science, Space, and Technology, U.S. House of Representatives	173

**NASA INFRASTRUCTURE:
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FRIDAY, SEPTEMBER 20, 2013

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON SCIENCE
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
Washington, D.C.

The Subcommittee met, pursuant to call, at 9:35 a.m., in Room 2318 of the Rayburn House Office Building, Hon. Steven Palazzo [Chairman of the Subcommittee] presiding.

LAMAR S. SMITH, Texas
CHAIRMAN

EDDIE BERNICE JOHNSON, Texas
RANKING MEMBER

**Congress of the United States
House of Representatives**

COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

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Subcommittee on Space

***NASA Infrastructure: Enabling Discovery and Ensuring
Capability***

Friday, September 20, 2013

9:30 a.m. to 11:30 a.m.

2318 Rayburn House Office Building

Witnesses

The Honorable Paul K. Martin, Inspector General, National Aeronautics and Space
Administration

Mr. Richard Keegan, Associate Deputy Administrator, National Aeronautics and Space
Administration



U.S. House of Representatives
Committee on Science, Space, and Technology
Subcommittee on Space

HEARING CHARTER

NASA Infrastructure: Enabling Discovery and Ensuring Capability

Friday, September 20, 2013
9:30 a.m. – 11:30 a.m.
2318 Rayburn House Office Building

Purpose

On Friday, September 20th, the Space Subcommittee will hold a hearing to review NASA's efforts to manage its facilities and infrastructure, the agency's current legislated authorities, and its proposed legislation to provide greater flexibility to the agency.

Witnesses

- **The Honorable Paul K. Martin**, Inspector General, National Aeronautics and Space Administration
- **Mr. Richard Keegan**, Associate Deputy Administrator, National Aeronautics and Space Administration

Background

NASA is the ninth largest Federal Government real property holder; however, nearly 80 percent of the agency's facilities are 40 or more years old.¹ A 2012 study by NASA estimated that NASA may have as many as 865 unneeded facilities, with maintenance costs of over \$24 million a year.² Similarly, NASA has a backlog of over \$2.19 billion in deferred maintenance.³

The NASA Office of the Inspector General (OIG), the Government Accountability Office (GAO), the National Academies, and Congress have repeatedly highlighted the need to address NASA's aging infrastructure. The NASA OIG issued an audit report in February 2013 titled, "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities."⁴ In August 2012, the NASA OIG issued an audit report titled, "NASA's Infrastructure and Facilities: An Assessment

¹ "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.i

² "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.i

³ "Deferred Maintenance Assessment Report," NASA, October 1, 2012.

⁴ "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>

of the Agency's Real Property Leasing Practices⁵." Several reports related to NASA's infrastructure were also released in 2011, including "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning⁶," "NASA's Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets⁷," and "Preparing for the Space Shuttle Program's Retirement: Review of NASA's Controls over Public Sales of Space Shuttle Property."⁸ The GAO issued several reports highlighting problems with Federal Real Property in 2007, as well as a 2012 report on NASA's Enhanced Use Leasing. A GAO report going as far back as 1996 noted that NASA would not meet its goal of reducing excess infrastructure by 25 percent by the end of that decade.⁹ See Appendix A for a more complete list of reports and recommendations related to NASA's infrastructure.

A 2012 National Academies report included the following recommendation:

"With respect to NASA centers: The administration and Congress should adopt regulatory and legislative reforms that would enable NASA to improve the flexibility of the management of its centers; and NASA should transform its network of field centers into an integrated system that supports its strategic plan and communications strategy and advances its strategic goals and objectives."¹⁰

The same report opined that, "If NASA were given more authority to manage its infrastructure instead of leaving this process to GSA, the agency could take better advantage of opportunities in the private sector."¹¹

The NASA Authorization Act of 2010 required a study of NASA's institutional requirements that would identify "a strategy to evolve toward the most efficient retention, sizing, and distribution of facilities, laboratories, test capabilities, and other infrastructure consistent with NASA's missions and mandates," stating that the Administrator, "should pay particular attention to identifying and removing unneeded or duplicative infrastructure."¹² NASA's response described a strategy to translate the Agency Facilities Strategy developed in 2009 into results through the creation of an Agency Master Plan (discussed below), and specifically through more integrated and prominent governance, specific facilities consolidation and renewal metrics, and a

⁵ "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices." Office of Inspector General. August 9, 2012. <http://oig.nasa.gov/audits/reports/FY12/IG-12-020.pdf>

⁶ "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning." Office of Inspector General. December 19, 2011. <http://oig.nasa.gov/audits/reports/FY12/IG-12-008.pdf>

⁷ "NASA's Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets." Office of Inspector General. August 4, 2011. <http://oig.nasa.gov/audits/reports/FY11/IG-11-024.pdf>

⁸ "Preparing for the Space Shuttle Program's Retirement: Review of NASA's Controls over Public Sales of Space Shuttle Property." Office of Inspector General. March 15, 2011. <http://oig.nasa.gov/audits/reports/FY11/IG-11-016.pdf>

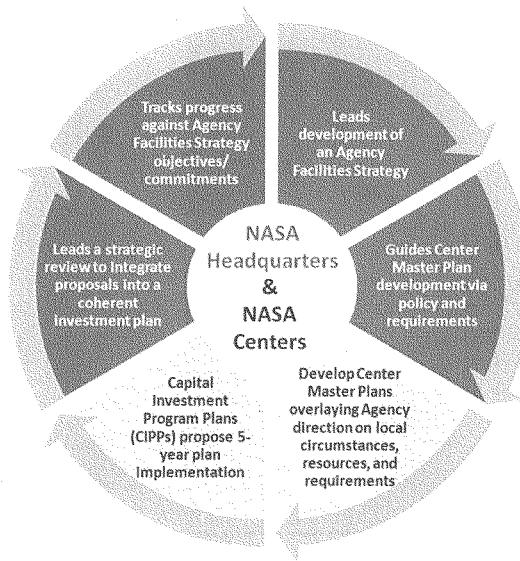
⁹ "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.i

¹⁰ "NASA's Strategic Direction and the Need for a National Consensus." The National Academy of Sciences. 2012. http://www.nap.edu/catalog.php?record_id=18248. P. 6

¹¹ "NASA's Strategic Direction and the Need for a National Consensus." The National Academy of Sciences. 2012. http://www.nap.edu/catalog.php?record_id=18248. P. 48

¹² Public Law 111-267, "NASA Authorization Act of 2010."

more “corporate” model for managing technical capabilities efficiently and effectively.¹³ In terms of governance, the report highlighted the elevation of the mission support function to the directorate level in 2010, the establishment of the Mission Support Council, and the initiation of the Corporate Portfolio Management Program.¹⁴ For metrics, the report noted NASA’s goal of a 10% reduction by 2020 and a 15% reduction by 2050. The division of responsibilities between Centers and Headquarters in responding to the challenges highlighted in the NASA Authorization Act of 2010 is illustrated below¹⁵:



In 2009, NASA developed an Agency Facilities Strategy and subsequently developed its first Agency-wide integrated master plan, based on Center input, to implement this strategy and align funding with facilities requirements.¹⁶ A December 2011 OIG report on the development of the Agency master plan found deficiencies within the individual Center plans that had the potential to limit the Agency plan’s usefulness. Specifically, the OIG report found that the Center plans “(1) were developed using funding assumptions for the recapitalization program that are no longer realistic and (2) are missing essential information needed to make objective Agency-wide real property decisions. In addition, 5 of the 10 Centers did not develop master plans to reduce

¹³ “NASA Institutional Requirements Study pursuant to Section 1102, NASA Authorization Act of 2010.” February 2012. p.4

¹⁴ “NASA Institutional Requirements Study pursuant to Section 1102, NASA Authorization Act of 2010.” February 2012. p.25

¹⁵ “NASA Institutional Requirements Study pursuant to Section 1102, NASA Authorization Act of 2010.” February 2012. p.24

¹⁶ “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities.” Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.v-vi

their real property footprint in accordance with Agency goals because of uncertain mission requirements.”¹⁷

The December 2011 report recommended that NASA:

- provide clear guidance to Centers on the information needed in the Centers’ master plans;
- ensure that plans to reduce the Agency’s real property footprint more fully consider the specific mission of the individual Centers when setting reduction requirements; and
- update NASA policy to better reflect the current risk-based process for prioritizing institutional Construction of Facilities projects.¹⁸

The February 2013 OIG report on NASA facilities maintenance indicated that the Agency was still implementing the recommendations made in the December 2011 audit.¹⁹

The most recent NASA OIG report noted that reducing infrastructure and facilities is a challenge because of the considerable changes in mission focus over the past six years due to the end of the Space Shuttle program, the initiation of the Constellation Program in 2004 and subsequent termination in 2010, and the development of the Space Launch System and Orion crew capsule. Agency culture and business practices, political pressure, and inadequate funding were also identified as challenges.²⁰

NASA currently utilizes several methods to reduce its infrastructure footprint. NASA may report excess property to the General Services Administration (GSA), which may subsequently sell the asset or transfer it to another Federal agency. At the completion of such a transfer, the property no longer belongs to NASA. NASA may out-grant an underutilized asset to another Federal entity through lease, easement, permit, license, Space Act Agreement, or a Memorandum of Understanding or Agreement. In this situation, the asset remains in NASA’s possession, even if it is used by another entity. Similarly, NASA may lease an underutilized asset to the private sector or a non-Federal public sector entity. In leasing any non-excess real property and related personal property to a non-Federal entity, NASA may use an enhanced use lease (EUL) for the arrangement, which allows NASA to retain and use the proceeds from the lease.²¹ EUL began as a pilot program after the Consolidated Appropriations Resolution of 2003 amended the National Aeronautics and Space Act of 1958 (“Space Act”) to state that the Administrator may enter into a lease with any person or entity for property under NASA jurisdiction at two centers.^{22,23} NASA

¹⁷ “NASA’s Infrastructure and Facilities: An Assessment of the Agency’s Real Property Master Planning.” Office of Inspector General. December 19, 2011. <http://oig.nasa.gov/audits/reports/FY12/IG-12-008.pdf> p.iii

¹⁸ “NASA’s Infrastructure and Facilities: An Assessment of the Agency’s Real Property Master Planning.” Office of Inspector General. December 19, 2011. <http://oig.nasa.gov/audits/reports/FY12/IG-12-008.pdf> , p.15-16

¹⁹ “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities.” Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf> , p.vi

²⁰ “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities.” Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf> , p.ii

²¹ NASA Real Estate Desktop Guide.

http://www.hq.nasa.gov/office/codej/codejx/Assets/Docs/NASA_Real_Estate_Desktop_Guide_July_2012_FINAL.pdf

²² Public Law 108-7, “Consolidated Appropriations Resolution of 2003.”

²³ “NASA Desk Guide for Enhanced Use Leasing of Real Property.” National Aeronautics and Space Administration. February 2010.

http://www.hq.nasa.gov/office/codej/codejx/Assets/Docs/EUL_Desk_Guide_Feb_2010.pdf

selected the Kennedy Space Center in Florida and Ames Research Center in California for this pilot program. Congress subsequently expanded the EUL program to include all Centers in 2008, with additional restrictions added.²⁴

In 2012, NASA began preparing for a comprehensive technical capability assessment to identify and evaluate the capabilities of individual Centers against the current and future needs of the Agency.²⁵ The assessment would enable NASA to rank each Center's principal capabilities and evaluate them against the needs of each Mission Directorate to identify potential areas of consolidation. The February 2013 OIG report cautioned that the Agency would face challenges in this process, including "transparency of the process to internal and external stakeholders and the inevitable political opposition to eliminating or consolidating capabilities and associated infrastructure at NASA Centers."²⁶ The report recommended that NASA's Associate Administrator complete the technical capabilities assessment and "ensure that the assessment includes a process for communicating decisions to outside stakeholders and is established into Agency policy."²⁷

ISSUES

Lack of a Comprehensive Exploration Roadmap

One of the greatest challenges facing NASA's management of its facilities and infrastructure is the lack of a comprehensive roadmap to identify long-term mission needs for human spaceflight exploration of the solar system. Without a long-term goal or destination the agency is unable to determine the facilities and infrastructure necessary to implement a strategy to achieve that goal. Last month, NASA released the International Space Exploration Coordination Group (ISECG) Global Exploration Roadmap (GER) that outlined an "international effort to prepare for collaborative space exploration missions beginning with the International Space Station (ISS)

²⁴ The Consolidated Appropriations Act of 2008 (Public Law No: 110-161) specified that EUL was to be used for "any non-excess real property and related personal property" as opposed to "any real property". This legislation also: limited the consideration that could be supplied for a lease, removing maintenance or construction as an option required that cash be provided for the lease at fair market (rather than other specified services, as had previously been allowed); required certification that a lease will not have a negative impact on NASA's mission; and added a sunset for EUL in December 2017.

The NASA Authorization Act of 2008 (Public Law No: 110-422) required the development of an agency-wide EUL policy that would contain: criteria for determining whether enhanced-use lease provides better economic value to the Government than other options; requirements for the identification and costs of proposed changes needed to ensure security of a site; measures of effectiveness for the program; and accounting controls and procedures to ensure accountability. The legislation also specified that of cash received not used to cover the cost of the lease, 35 percent must be deposited in a capital asset account, and the remaining 65 percent available to the Center engaged in the lease for to be used for maintenance and improvements.

The Consolidated and Further Continuing Appropriations Act, 2012 (Public Law No: 112-55) allowed in-kind consideration for leases for the purpose of developing renewable energy production facilities.

²⁵ "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.vii

²⁶ "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.vii

²⁷ "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities." Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.viii

and continuing to the Moon, near-Earth asteroids, and Mars.”²⁸ This roadmap, however, is not a NASA-specific commitment, strategy, or plan. H.R. 2687 and S. 1317, the NASA Authorization Acts passed by the House Science, Space, and Technology Committee and the Senate Commerce, Science, and Transportation Committee, respectively, both contained provisions directing NASA to develop such a roadmap.^{29,30} Absent a roadmap and stability of purpose for NASA’s human spaceflight exploration mission objectives, NASA will continue to be unable to determine what facility and infrastructure capabilities are needed.

Management Options

As NASA seeks to manage its infrastructure challenges, it is important that it follows a rigorous process to ensure that facilities and capabilities are not lost because of short-sighted decisions and that appropriate oversight is conducted to ensure taxpayer equities are appropriately considered. NASA should also follow an established and transparent process for determining whether to dispose of a property (by excess to GSA or demolition), or whether to grant the property to others. Similarly, NASA should establish a transparent process for determining what type of contractual out-grant mechanism (e.g., transfer, lease, etc.) should be utilized.

Another issue is whether additional legislative authorities are necessary for NASA to optimize property management, including the establishment of a capital fund which would allow NASA, or NASA centers, to manage funds derived from the private sector use of NASA facilities. Various capital fund proposals have also been accompanied with oversight mechanisms to ensure agency decisions are transparent and appropriate. Additional authorities include expanded permission to streamline the conveyance of property, broader EUL authority, and various other pilot projects. Different centers are also exploring innovative infrastructure strategies, such as Langley Research Center’s 20-Year Revitalization Plan.

Launch Complex 39A

With the end of the Space Shuttle program in 2011, NASA is planning to lease Launch Complex 39A (LC 39A) at Kennedy Space Center to the private sector. Two companies, Space Exploration Technologies (SpaceX) and Blue Origin, have publically declared that they submitted proposals to operate LC 39A, with Blue Origin’s proposal aimed toward supporting a multi-user facility, while SpaceX proposes exclusive use of the launch pad. Earlier this month, Blue Origin filed a formal protest with the Government Accountability Office regarding the bid process.³¹ A letter signed by five senators was also sent to Administrator Bolden raising concerns that an unfair advantage would be created by an exclusive lease to SpaceX.³² [Update:

²⁸ The Global Exploration Roadmap, NASA, August 2013. http://www.nasa.gov/sites/default/files/files/GER-2013_Small.pdf

²⁹ H.R. 2687, “National Aeronautics and Space Administration Authorization Act of 2013”. Representative Steven Palazzo et al. <http://lis.gov/cgi-lis/query/z?c113:H.R.2687>:

³⁰ S. 1317, “National Aeronautics and Space Administration Authorization Act of 2013.” Senator Bill Nelson et al. <http://lis.gov/cgi-lis/query/z?c113:S.1317>:

³¹ Dean, James. “Launch company Blue Origin protests possible deal for pad 39A.” Florida Today. September 8, 2013. <http://www.floridatoday.com/article/20130908/SPACE/309080042/Launch-company-Blue-Origin-protests-possible-deal-pad-39A>

³² Letter to Administrator Bolden from Senators Hatch, Inhofe, Landrieu, Murray, and Vitter. September 5, 2013.

A letter signed by the Florida House delegation was sent after this charter was released supporting the prompt lease of the facility^{33]}

Shiloh

Space Florida, an independent agency for economic development for the state of Florida, has sought to acquire a NASA-owned site known as Shiloh, following the end of the Space Shuttle program.³⁴ Space Florida was initially rebuffed by NASA because “the property identified in [the] request has not been reported as excess. Furthermore, this property continues to serve NASA long-term mission requirements, as a buffer zone between NASA mission and local communities and as a potential site for future mission requirements.”³⁵ Conversations between NASA and Space Florida have continued, but without resolution.³⁶ In July 2013, Space Florida announced that it was soliciting an independent consultant to conduct an environmental study of the potential impacts of construction and operating a commercial launch complex at the site.³⁷

Arc Jet

On January 19, 2011, NASA decided that it would close the arc jet facility at the Johnson Space Center (JSC) and consolidate all operations at the Ames Research Center where another arc jet facility exists.³⁸ The expected savings of the consolidation was reportedly \$5 million per year.³⁹ NASA stated that the consolidation would not result in any foreseeable loss in capabilities, but if an additional need was identified it could supplement the Ames arc jet facility by utilizing a Department of Defense arc jet.⁴⁰ However, a report from the Office of the Chief Engineer found that “...proposed NASA missions over the next 30 years will require arc jet capabilities beyond what exist today” and that “...no current facility, including those at Arnold Engineering Development Center [DOD] and the Large Core Arc Tunnel [Boeing], can deliver the heating rates, pressures, and shear levels at the scale and duration needed for cost-effective, weight-efficient, and reliable design of thermal protection systems for safe return from Mars or near-

³³ Letter from Florida House delegation to Charles Bolden, Administrator, NASA, September 16, 2014.

³⁴ Green, Amy. With NASA Shuttles Gone, Florida Towns Suffer, Court SpaceX. WNYC. May 3, 2013.

http://www.wnyc.org/blogs/transportation-nation/2013/may/03/florida_wants_nasa_to_turn_land_over_to_spacex_1/

³⁵ Matthews, M.K. “State scrambles to get NASA’s OK for land to build Launchpad. The Orlando Sentinel. January 29, 2013. http://articles.orlandosentinel.com/2013-01-29/news/os-shiloh-nasa-spacex-florida-20130127_1_space-florida-nasa-state-scrambles

³⁶ Green, Amy. With NASA Shuttles Gone, Florida Towns Suffer, Court SpaceX. WNYC. May 3, 2013.

http://www.wnyc.org/blogs/transportation-nation/2013/may/03/florida_wants_nasa_to_turn_land_over_to_spacex_1/

³⁷ “Space Florida Initiates Environmental Study Process for Proposed Commercial Spaceport.” Space Ref. July 15, 2013. <http://www.spaceref.com/news/viewpr.html?pid=41185>

³⁸ “Arc Jet Testing Capabilities,” Memo from Associate Administrator for Mission Support Directorate to Officials-in Charge of Headquarters Offices and Directors, NASA Centers, February 14, 2011.

³⁹ Carreau, Mark, “NASA Fiscal 2014 Budget Trims Workforce, Facilities, Consultants,” Aerospace Daily & Defense Report, April 15, 2013.

⁴⁰ Letter from Seth Statler, Associate Administrator for Congressional Relations, to Rep. Pete Olson, June 5, 2012.

Earth objects.”⁴¹ Since the decision was announced, NASA initiated a \$22.9 million contract to replace the Complex Steam Vacuum System Boiler at ARC.⁴²

Test Stands

The February 2013 OIG report noted that, “As many as 14 of the Agency’s 35 rocket engine test stands are currently underutilized or NASA managers could not identify how these facilities are needed to support future missions. NASA’s use of test stands has declined in recent years primarily due to a lack of new, large-scale propulsion test programs. The ongoing development of the heavy-lift rocket associated with NASA’s Space Launch System (SLS) is not expected to alter this trend.”⁴³ However, various private sector interests have expressed interest in utilizing NASA test stands.

Wind Tunnels

Facilities used by NASA’s Aeronautics Research Mission Directorate, such as wind tunnels, present a unique challenge in that NASA maintains infrastructure that is used by various American aerospace companies and other Federal agencies such as the Department of Defense. The February 2013 OIG report noted that, “At least 6 of NASA’s 36 wind tunnels are currently underutilized or NASA managers could not identify how these facilities are needed to support future missions. NASA’s use of wind tunnels has declined in recent years due to a reduction in the Agency’s aeronautics budget, fewer new aircraft developments by the Department of Defense and private industry, newer and more capable foreign testing facilities, and the advent of alternative testing methods such as Computational Fluid Dynamics.”⁴⁴ Determining the fate of these facilities requires discussion not only with NASA, but also with the other agencies and companies that may have a future needs for the national capability that NASA provides.

⁴¹ Evaluation of the NASA Arc Jet Capabilities to Support Mission Requirements, NASA Office of the Chief Engineer, NASA/SP-2010-577, May 2010.

⁴² “Replace Arc Jet Complex Steam Vacuum System Boiler,” Solicitation Number NNA13418436R, NASA, August 23, 2013.

⁴³ “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities.” Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.iii

⁴⁴ “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities.” Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p.iii

Appendix A: Reports Related to Infrastructure

NASA

- **Augustine Commission Report:** “The right mission and the right size: NASA’s budget should match its mission and goals. Further, NASA should be given the ability to shape its organization and infrastructure accordingly, while maintaining facilities deemed to be of national importance.”⁴⁵
- **Columbia Accident Investigation Board Report:**
 - “Deteriorating Shuttle Infrastructure: The same ambiguity about investing in Shuttle upgrades has also affected the maintenance of Shuttle Program ground infrastructure, much of which dates to Project Apollo and 1970s Shuttle Program construction. Figure 5.5-4 depicts the age of the Shuttle’s infrastructure as of 2000. Most ground infrastructure was not built for such a protracted lifespan. Maintaining infrastructure has been particularly difficult at Kennedy Space Center, where it is constantly exposed to a salt water environment. Board investigators have identified deteriorating infrastructure associated with the launch pads, Vehicle Assembly Building, and the crawler transporter. Figures 5.5-5 and 5.5-6 depict some of this deterioration. For example, NASA has installed nets, and even an entire sub-roof, inside the Vehicle Assembly Building to prevent concrete from the building’s ceiling from hitting the Orbiter and Shuttle stack. In addition, the corrosion-control challenge results in zinc primer on certain launch pad areas being exposed to the elements. When rain falls on these areas, it carries away zinc, runs onto the leading edge of the Orbiter’s wings, and causes pinholes in the Reinforced Carbon-Carbon panels (see Chapter 3). In 2000, NASA identified 100 infrastructure items that demanded immediate attention. NASA briefed the Space Flight Advisory Committee on this ‘Infrastructure Revitalization’ initiative in November of that year. The Committee concluded that ‘deteriorating infrastructure is a serious, major problem,’ and, upon touring several Kennedy Space Center facilities, declared them ‘in deplorable condition.’ NASA subsequently submitted a request to the White House Office of Management and Budget during Fiscal Year 2002 budget deliberations for \$600 million to fund the infrastructure initiative. No funding was approved. In Fiscal Year 2002, Congress added \$25 million to NASA’s budget for Vehicle Assembly Building repairs. NASA has reallocated limited funds from the Shuttle budget to pressing infrastructure repairs, and intends to take an integrated look at infrastructure as part of its new Shuttle Service Life Extension Program. Nonetheless, like Space Shuttle upgrades, infrastructure revitalization has been mired by the uncertainty surrounding the Shuttle Program’s lifetime. Considering that the Shuttle will likely be flying for many years to come, NASA, the White House, and

⁴⁵ “Seeking a Human Spaceflight Program Worthy of a Great Nation.” Review of Human Spaceflight Plans Committee (Augustine Commission). http://www.nasa.gov/pdf/396093main_HSF_Cmte_FinalReport.pdf, p.16

Congress alike now face the specter of having to deal with years of infrastructure neglect.”⁴⁶

- “O10.6-2 NASA and United Space Alliance managers must understand workforce and infrastructure requirements, match them against capabilities, and take actions to avoid exceeding thresholds.”⁴⁷

NASA Office of Inspector General

- **NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities (February 12, 2013)**
 - **Recommendation 1.** Complete the ongoing comprehensive technical capabilities assessment and ensure the process is established into policy.
 - **Recommendation 2.** Ensure the assessment includes a process for communicating decisions to outside stakeholders to promote transparency and agreement.
 - **Recommendation 3.** Expedite implementation of Corporate Portfolio Management and ensure the process is updated, documented, and established into policy.
 - **Recommendation 4. a.** Implement changes to NASA Technical Capabilities Database to improve data accuracy, including developing a process to ensure multiple facilities are not captured under one capability.
 - **Recommendation 4. b.** Implement changes to NTCD to improve data accuracy, including developing and implementing a process to validate data input by the Centers into NTCD.⁴⁸
- **NASA’s Infrastructure and Facilities: An Assessment of the Agency’s Real Property Leasing Practices (August 9, 2012)**
 - **Recommendation 1.** Clarify the criteria Centers should use to determine whether underutilized property has a current or future mission-related use and provide training to Center personnel on the revised criteria.
 - **Recommendation 2.** Coordinate with the Centers to develop a process to maintain a complete inventory of real property available for leasing.
 - **Recommendation 3.** Develop guidance that requires increased consideration of Federal entities for leasing opportunities and coordination with GSA to identify potential Federal tenants.
 - **Recommendation 4.** Develop guidance and training for personnel addressing the requirements and best practices for marketing leasing opportunities to non-Federal entities.
 - **Recommendation 5.** The Associate Administrator for Mission Support should clarify guidance to ensure the widest possible publication of leasing opportunities and competition when appropriate.

⁴⁶ “Columbia Accident Investigation Board: Report Volume 1.” August 2003. http://s3.amazonaws.com/akamai.netstorage/anon.nasa-global/CAIB/CAIB_lowres_full.pdf, p. 221

⁴⁷ “Columbia Accident Investigation Board: Report Volume 1.” August 2003. http://s3.amazonaws.com/akamai.netstorage/anon.nasa-global/CAIB/CAIB_lowres_full.pdf, p. 221

⁴⁸ “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities.” Office of Inspector General. February 12, 2013. <http://oig.nasa.gov/audits/reports/FY13/IG-13-008.pdf>, p. 29.30

- **Recommendation 6.** The Associate Administrator for Mission Support should instruct Center management of the limitations of their signature authority regarding real property agreements.
- **Recommendation 7.** The Associate Administrator for Mission Support should review all real property agreements to ensure they are consistent with applicable statutes and regulations regarding proper signature authority and required contractual terms.
- **Recommendation 8.** We recommended that the Associate Administrator for Mission Support develop guidance for determining whether in-kind consideration provides the best value to the Government.⁴⁹
- **NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning (December 19, 2011)**
 - **Recommendation 1.** Provide clear guidance to the Centers on the information that should be included in Center master plans to ensure that key information is captured and consistent for all Centers. Information should include, at minimum, clear linkages between projects and Agency or Center goals, as well as information on all major institutional and programmatic CoF [Construction of Facilities] projects.
 - **Recommendation 2.** Ensure plans to reduce the Agency's real property footprint more fully consider the specific missions of the individual Centers when setting real property reduction requirements.
 - **Recommendation 3.** Update NASA policy to better reflect the current risk-based process for prioritizing institutional CoF projects.⁵⁰
- **NASA's Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets (August 4, 2011)**
 - **Recommendation 1.** Establish processes for the Centers that accurately capture the utilization rates of facilities in the RPMS [Real Property Management System]. These processes should include, at a minimum, the use of quantitative methods to calculate utilization rates and annual inspections of facilities.
 - **Recommendation 2.** Revise NASA policy to include guidance for conducting mission dependency reviews, including developing a consistent definition of the mission reviewers should consider when performing the reviews.
 - **Recommendation 3.** Reassess and revise, as appropriate, contracts for condition assessments to provide contractors sufficient detail and direction to ensure that the Agency is provided comprehensive assessments of the physical condition of its facilities.⁵¹
- **Preparing for the Space Shuttle Program's Retirement: Review of NASA's Controls over Public Sales of Space Shuttle Property (March 15, 2011)**
 - **Recommendation 1.a.** The Assistant Administrator for Strategic Infrastructure should coordinate with the Associate Administrator for International and

⁴⁹ "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices." Office of Inspector General. August 9, 2012. <http://oig.nasa.gov/audits/reports/FY12/IG-12-020.pdf> p. 12, 14-15, 22, 26

⁵⁰ "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning." Office of Inspector General. December 19, 2011. <http://oig.nasa.gov/audits/reports/FY12/IG-12-008.pdf> p. 15-16

⁵¹ "NASA's Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets." Office of Inspector General. August 4, 2011. <http://oig.nasa.gov/audits/reports/FY11/IG-11-024.pdf> p. 15-16

Interagency Relations and include in the planned revision of NPR 4300.1A a clear explanation of how NASA's property disposition activities, including domestic property sales, could result in a violation of export control laws.

- **Recommendation 1.b.** The Assistant Administrator for Strategic Infrastructure should coordinate with the Associate Administrator for International and Interagency Relations and include in the planned revision of NPR 4300.1A requirements that responsible property disposal and export control personnel ensure that export control determinations are made before property is disposed of and that the eligibility of potential buyers is verified prior to releasing controlled items to them. At a minimum, verifying buyer eligibility should include verifying citizenship and comparing identities with both the Department of State's debarred parties list and the Department of Commerce's denied persons list prior to the sale of export controlled.
- **Recommendation 2.** The Associate Administrator for International and Interagency Relations should revise NPR 2190.1 to explain how NASA's domestic sales of property may result in exports and to require a review of Centers' export-controlled property disposition activities during annual Export Control Program audits.
- **Recommendation 3.** The Director, Kennedy Space Center, should clarify KDP-KSC-P-3716 and KDP-KSC-P-2613 to reflect the recommended revisions to NPR 4300.1A and NPR 2190.1.
- **Recommendation 4.** The Director, Johnson Space Center, should clarify Johnson Space Center Work Instruction 4300.1 and Johnson Space Center Work Instruction 2190.1 to reflect the recommended revisions to NPR 4300.1A and NPR 2190.1.
- **Recommendation 5.a.** The Office of the Chief Financial Officer should determine how much of the FY 2010 proceeds remain unobligated.
- **Recommendations 5.b.** The Office of the Chief Financial Officer should proactively coordinate with the Exploration Systems Mission Directorate's Resources Management Office to make timely use of the funds in accordance with the relevant Financial Management Operating Procedures or, if necessary, request that GSA extend the time period during which NASA may make use of the funds.⁵²
- **Audit NASA's Facilities Maintenance (March 2, 2011)**⁵³
- **Final Memorandum on NASA's Accounting for Real Property Leased to Other Entities (December 11, 2007)**
 - **Recommendation 1.a.** We recommended that the NASA Chief Financial Officer and the Director, Facilities Engineering and Real Property Division, review and revise the relevant FMR sections and NPR to clarify the policy and procedures related to the recording of leased real property whereby NASA is the lessor under both capital and operating leases. Topics to be considered for inclusion in the

⁵² "Preparing for the Space Shuttle Program's Retirement: Review of NASA's Controls over Public Sales of Space Shuttle Property." Office of Inspector General. March 15, 2011. <http://oig.nasa.gov/audits/reports/FY11/IG-11-016.pdf>, p. 9-11

⁵³ "Audit of NASA's Facilities Maintenance (Report No. IG-11-015; Assignment No. A-09-002-00)." March 2, 2011. <http://oig.nasa.gov/audits/reports/FY11/IG-11-015.pdf>

revisions are the definition of terms used to indicate that property has been leased to another entity, reference to the accounting procedures for reimbursable agreements for the recording of collections under leases, and the procedures for recording leased assets in the accounting records. During the revision process, there should be coordination between the OCFO and FERPD to ensure that the terminology being used by each office is consistent.

- **Recommendation 1.b.** We recommended that the NASA Chief Financial Officer and the Director, Facilities Engineering and Real Property Division, provide training on the revised FMR and NPR as a result of the above recommendation to OCFO and FERPD personnel at both Headquarters and the Centers affected by the revisions.
- **Recommendation 2.a.** We recommended that the NASA Chief Financial Officer perform an analysis of all real property leased to other entities under an operating lease. The analysis should identify all relevant property with costs that meet or exceed the capitalization threshold and for which the useful life has not expired. Based on the results of the analysis, an adjustment should be recorded in the accounting records. When determining the adjustment amount, consideration should be given and a determination made as to whether the adjustment or a portion thereof should be recorded as a prior period adjustment.⁵⁴

National Academy of Science

NASA's Strategic Direction and the Need for a National Consensus

- “Legislative and regulatory limitations on NASA’s freedom to manage its workforce and infrastructure constrain the flexibility that a large organization needs to grow or shrink specific scientific, engineering, and technical areas in response to evolving goals and budget realities.”⁵⁵
- **“Recommendation: With respect to NASA centers:**
 - The administration and Congress should adopt regulatory and legislative reforms that would enable NASA to improve the flexibility of the management of its centers.
 - NASA should transform its network of field centers into an integrated system that supports its strategic plan and communications strategy and advances its strategic goals and objectives.”⁵⁶
- **“Infrastructure flexibility.** The General Services Administration (GSA) imposes restrictions on government agencies charging less than fair market value for facilities, making it difficult for NASA to dispose of facilities it no longer needs. Easing such restrictions for NASA could save the government money by not having to maintain or demolish buildings no longer required by NASA. In addition, current regulations require that disposed property first be offered to state and local governments, a requirement that

⁵⁴ “Final Memorandum on NASA’s Accounting for Real Property Leased to Other Entities.”

<http://oig.nasa.gov/audits/reports/FY08/IG-08-004.pdf>, P. 6-7

⁵⁵ “NASA’s Strategic Direction and the Need for a National Consensus.” Committee on NASA’s Strategic Direction, National Research Council. 2012. http://download.nap.edu/cart/download.cgi?record_id=18248, p. 6

⁵⁶ “NASA’s Strategic Direction and the Need for a National Consensus.” Committee on NASA’s Strategic Direction, National Research Council. 2012. http://download.nap.edu/cart/download.cgi?record_id=18248, p. 6

could slow down or hinder the ability to find private users. If NASA were given more authority to manage its infrastructure instead of leaving this process to GSA, the agency could take better advantage of opportunities in the private sector.”⁵⁷

America’s Future in Space

- Foundational element of an effective U.S. space program: “An effectively sized and structured infrastructure—realizing synergy from the public and private sectors and from international partnerships.”⁵⁸
- “This infrastructure, much of it supported by NASA, was built on the National Advisory Committee for Aeronautics centers existing at the time of NASA’s founding and was expanded during the ramp-up of the Apollo program. The NASA centers provide unique capabilities essential to the civil space program in the years ahead, including rocket test facilities, spacecraft assembly facilities and flight control centers, and launch facilities, as well as personnel with expertise that universities and industry could not necessarily supply...DOD is responsible for the nation’s launch complexes and ranges at Cape Canaveral Air Force Station and Vandenberg Air Force Base, which support military launches and which also provide collateral support to NASA and commercial launch operations. It also maintains the worldwide space surveillance network used by all U.S. agencies, as well as commercial and foreign entities, and a satellite command and control network that provides support to civil operations...The DOD also supports cooperative space development testing with its own space facilities in cooperation with NASA and commercial programs...Essential infrastructure is also provided by NOAA, which has an array of tracking stations and data and information systems to conduct its meteorological and environmental satellite observing programs. U.S. universities and both federal and nongovernment laboratories house many of the organizations and facilities where U.S. space science and engineering research is conducted...A healthy U.S. civil space program should be able to optimize the participation and responsibilities of all three involved sectors—government, industry, and academia. Such an optimized institutional partnership would:
 - develop and nurture a culture of cooperation achieved through sharing of facilities and intellectual capacity;
 - ensure that facilities—at NASA, NOAA, and elsewhere—are sized, maintained, and distributed properly so as to be vital components of a larger civil space enterprise without their maintenance becoming an impediment to a balanced division of resources within and outside the agencies;
 - provide necessary support for facilities, human capital, technology transition, innovation, and entrepreneurial activities; and
 - regularly assess mission performance, technical expertise, and the strengths of interactions across all three sectors.”⁵⁹

⁵⁷ “NASA’s Strategic Direction and the Need for a National Consensus.” Committee on NASA’s Strategic Direction, National Research Council. 2012. http://download.nap.edu/cart/download.cgi?record_id=18248, p. 48

⁵⁸ “America’s Future in Space.” Committee on the Rationale and Goals of the U.S. Civil Space Program; National Research Council. 2009. http://www.nap.edu/download.php?record_id=12701, p. 5

⁵⁹ “America’s Future in Space.” Committee on the Rationale and Goals of the U.S. Civil Space Program; National Research Council. 2009. http://www.nap.edu/download.php?record_id=12701, p. 54-56

Government Accountability Office

Improved Cost Reporting Would Help Decision Makers Weigh the Benefits of Enhanced Use Leasing (2012)

- Recommendation: “To promote transparency about EULs, improve decision-making regarding EULs, and ensure more accurate accounting of EUL net benefits, we recommend that OMB work with VA, NASA, State, and USDA, and any other agencies with EUL authority, to ensure that agencies consistently attribute all costs associated with EULs (such as consulting, termination, and leaseback costs) to their EUL programs, as appropriate.”⁶⁰

Enhanced Use Leasing Program Needs Additional Controls (2007)

- Recommendation: “Before NASA considers requesting that the Congress extend EUL authority to additional centers, we recommend that the NASA Administrator develop an agency wide EUL policy, based upon sound business practices and lessons learned from the demonstration centers, that establishes controls and processes to ensure accountability and protect the government’s interests, including:
 - criteria for determining that EUL represents the best economic value for the government, compared with other options, such as federal financing through appropriations or sale of the property;
 - measures of effectiveness for the EUL program, such as reductions in the square footage of underutilized property and in the dollar amount of deferred maintenance; and
 - accounting controls and processes to ensure accountability, such as an
 - accounting system for tracking the value of in-kind consideration; and
 - audit trail and documentation to readily support financial transactions.

In addition, if NASA receives expanded EUL authority, the agency also needs to adopt mechanisms to keep the Congress fully informed of the agency’s activity under EUL authority, including:

- identifying and quantifying the value of in-kind consideration arrangements and expenditures of EUL revenue in its annual EUL reports to the Congress, and
- reporting the availability and use of EUL funds in the agency’s operating plans.”⁶¹

Federal Real Property: Progress Made Toward Addressing Problems, but Underlying Obstacles Continue to Hamper Reform (2007)

- “We are making three recommendations to OMB’s Deputy Director for Management. We recommend that the Deputy Director, in conjunction with FRPC, take the following three actions:
 - develop a framework that agencies can use to better ensure the validity and usefulness of key real property data in the FRPP. At a minimum, the framework would suggest standards for frequency of validation methods,

⁶⁰ “Improved Cost Reporting Would Help Decision Makers Weigh the Benefits of Enhanced Use Leasing.” Government Accountability Office. December 2012. <http://gao.gov/assets/660/651028.pdf>, p.20

⁶¹ “Enhanced Use Leasing Program Needs Additional Controls.” Government Accountability Office. March 1, 2007. <http://gao.gov/products/GAO-07-306R>, p.5-6

- develop an action plan for how the FRPC will address key problems, including the continued reliance on costly leasing in cases where ownership is more cost effective over the long term, the challenges of securing real property assets, and reducing the effect of competing stakeholder interests on businesslike outcomes in real property decisions; and
- establish a clearer link or crosswalk between agencies' efforts under the real property initiative and broader capital planning guidance.”⁶²

Space Foundation

Pioneering: Sustaining U.S. Leadership in Space

- “The second element of restructuring the national civil space enterprise is consolidating and trimming unused and excess infrastructure and capital assets...There are three critical points to emphasize about streamlining NASA. The first is that the exercise is not to “punish” some parts of NASA and get rid of them...The second point is that it is neither reasonable nor necessary to close entire centers, provided that centers can effectively shed their excess infrastructure as has been done with some of the old space shuttle facilities...The third point is that a principal function of the entire exercise is not to just close down buildings, but to engage with and get the buy-in of the agency as a whole for the new pioneering mission.
 ...It will be much easier to pursue this task if NASA has better positive incentives to cut its infrastructure. Currently, NASA cannot recover the costs for decommissioning something even if it results in revenue for the U.S. government. Some agencies, such as the Department of State and the DoD, can keep the proceeds from the sale of excess property without even needing to have the funds returned to them through appropriations. If NASA centers are able to keep the proceeds of sales, they would be more likely to get rid of some older facilities to pay for upgrades or maintenance on the facilities they keep. An obstacle to trimming facilities in a fair and equitable manner is that the centers all use different standards and language to keep track of their property. Based on experiences elsewhere in government, it will be most effective to conduct a facilities audit with independent commissioners who will be able to manage some of the trades between centers and act as a neutral evaluator. As with previous similar efforts, the independent commissioners would present their plan to the President and then Congress as a package. This package would be voted on in its entirety, so as to share responsibility for the consequences of an audit and to compel people to make choices, even if those choices are difficult.
 The inclusion of incentives and independent commissioners is geared toward establishing buy-in for the pioneering mission. Center directors have learned the hard way that a good-faith effort to reduce facilities can become a trap if priorities change and a retired piece of hardware is needed again. Furthermore, if a center director gets rid of something during one cost-cutting initiative, it does not necessarily buy easier terms during the next

⁶² “Federal Real Property: Progress Made Toward Addressing Problems, but Underlying Obstacles Continue to Hamper Reform.” Government Accountability Office. April 2007. <http://gao.gov/products/GAO-07-349>, p. 49

round—in fact, it simply reduces the number of things to choose among in future cutbacks.”⁶³

⁶³ “Pioneering: Sustaining U.S. Leadership in Space.” The Space Foundation. December 2012. <http://www.spacefoundation.org/programs/research-and-analysis/pioneering>, p.45-47.

Appendix B: Legislative Language Proposed by NASA⁶⁴

Disposal of Personal Property for Use in Commercial Space Transportation Services

SEC. ____ . DISPOSAL OF PERSONAL PROPERTY FOR USE IN COMMERCIAL SPACE TRANSPORTATION SERVICES AND SPACE-RELATED ACTIVITIES.

(A) AUTHORITY FOR SALE OF PERSONAL PROPERTY FOR USE IN COMMERCIAL SPACE TRANSPORTATION SERVICES AND SPACE-RELATED ACTIVITIES.—Chapter 201 of title 51, United States Code, is amended –

(A) by deleting the “and” from the end of subsection (4) of Section 20113(c)

(B) by deleting the “,” from the end of subsection (5) of Section 20113(c) and inserting “;and”.

(C) by adding the following new subsection (6) to Section 20113(c):

(A) to sell or otherwise dispose of excess personal property when such sale will support the development of the United States commercial space industry. Sale of excess personal property under this subsection is authorized if —

(i) the Administrator determines that

(I) the sale of said personal property will support the development and delivery of space-related activities and space transportation services by current or potential United States commercial providers;

(II) equivalent personal property is not commercially available on reasonable terms;

(III) the personal property has commercial value when used for its intended purpose; and

(IV) the sale of said personal property is consistent with public safety, national security, and international treaty obligations;

(ii) the sale is subject to obtaining competition that is feasible under the circumstances;

(iii) the sale is accompanied by a written instrument providing that the personal property shall be used and maintained by the purchaser solely for the purpose for which it was sold, will be utilized to support the development and delivery of space-related activities and space transportation services, and shall not be further sold or transferred except as part of the sale of all or substantially all of the assets of the purchaser; and such additional terms, reservations, restrictions and conditions that the Administrator determines are necessary to ensure use of the personal property for the purposes for which it was conveyed and to safeguard the interests of the Government;

(iv) the sale includes consideration for the transfer of the personal property as determined by the Administrator to be proper,

(B) Notwithstanding any of the provision of law, the General Services Administration may act as the sales agent for sales conducted under this subsection. The expenses incurred by the Administration or its sales agent in conducting sales under this subsection may be paid from the proceeds of such sales. ”

⁶⁴ “NASA Statutory and Sectional Analysis Language.”

SECTIONAL ANALYSIS:

This proposal would provide a mechanism for NASA to support United States commercial providers of space transportation services and space-related activities by providing a mechanism to transfer excess federal personal property directly to such providers through disposal after the personal property has been reported excess to NASA's needs. The proposed legislation would authorize sale of personal property to support the development of the United States commercial space industry upon appropriate determination by the Administrator once the personal property has been reported excess by NASA. Any personal property subject to sale under the proposed legislation would be subject to reasonable competition and would require that the Administrator determine appropriate consideration for any sale. NASA anticipates that it will work with GSA to permit GSA to act as NASA sales agent for sales conducted under this authority.

This proposal would authorize the use of sale of excess personal property only when a determination can be made that:

- sale of said personal property will support the development and delivery of space-related activities and space transportation services by current or potential United States commercial providers;
- equivalent personal property is not commercially available on reasonable terms;
- the personal property will be used for its intended purpose and will be utilized to support the development and delivery of space-related activities and space transportation services; and
- the sale of said personal property to a commercial provider is consistent with public safety, national security, and international treaty obligations.

Many NASA Centers are exploring options for currently under-utilized equipment that could be of potential benefit to commercial industry. The proposed legislation will enable the availability of such equipment for the productive use by the commercial space industry whereas otherwise the equipment would be stored unused or potentially destroyed. NASA believes that this authority will provide industry increased benefits along with potentially reduced risks. For example, equipment sold rather than provided under a time-limited or terminable loan agreement would provide a commercial company greater certainty in developing plans and managing investments in infrastructure over time. Further, the unique equipment that once provided value to NASA would continue providing value to commercial industry without requiring NASA to maintain ownership, potential liability and administrative responsibilities for the personal property.

This proposal implements the foundational activity set forth in the 2010 National Space Policy (June 28, 2010) to:

Strengthen U.S. Leadership In Space-Related Science, Technology, and Industrial Bases. Departments and agencies shall: conduct basic and applied research that increases capabilities and decreases costs, where this research is best supported by the government; *encourage an innovative and entrepreneurial commercial space sector; and help ensure the availability of space-related industrial capabilities in support of critical government functions.* (emphasis supplied).

The current proposal uses the terms “commercial provider;” “space-related activities;” “space transportation services; and “United States commercial provider.” These terms are defined elsewhere in Title 51 in the Commercial Space Act of 1998, 51 U.S.C. §§ 50101 et seq. This narrowly targets the beneficiaries of the proposed authority to those entities as required to benefit the Federal Government by facilitating the availability of services from United States commercial providers so such services can be acquired by the Federal Government as required under the Commercial Space Act of 1998.

Impacts:

None envisioned. The proposal applies only to excess federal personal property – personal property that has been declared excess by NASA and no longer needed for Agency missions. It is anticipated the opportunity to ensure that unneeded NASA personal property is further utilized in a productive capacity will encourage the reporting of additional NASA personal property as excess. This will reduce NASA’s current inventory of personal property and potential reduce the cost to maintain personal property with limited programmatic utility.

Associated costs:

No additional costs above those required to administer the personal property disposal process.

Authority to Support Commercial Space through Acquisition and Joint Infrastructure Development

NASA Statutory and Sectional Analysis Language

SEC. ____ COMMERCIAL SPACE LAUNCH COOPERATION.

(a) In General.—Chapter 201 of title 51, United States Code, is amended by adding at the end the following new section:

“§ 20148. Commercial space launch cooperation

‘(a) Authority for Agreements Relating to Space Transportation Infrastructure- The Administrator of the National Aeronautics and Space Administration--

‘(1) may enter into an agreement with a covered entity to provide the covered entity with support and services related to the space transportation infrastructure of the National Aeronautics and Space Administration; and

‘(2) upon the request of such covered entity, may include such support and services in the space launch and reentry range support requirements of the National Aeronautics and Space Administration if--

‘(A) the Administrator determines that the inclusion of such support and services in such requirements--

‘(i) is in the best interest of the Federal Government;

‘(ii) does not interfere with the requirements of the National Aeronautics and Space Administration; and

‘(iii) does not compete with the commercial space activities of other covered entities, unless that competition is in the national security interests of the United States; and

‘(B) any commercial requirement included in the contract has full non-Federal funding before the execution of the contract.

‘(b) Contributions-

‘(1) IN GENERAL- The Administrator of the National Aeronautics and Space Administration may enter into an agreement with a covered entity on a cooperative and voluntary basis to accept contributions of funds, services, and equipment to carry out this section.

‘(2) USE OF CONTRIBUTIONS- Any funds, services, or equipment accepted by the Administrator under this subsection--

‘(A) may be used only for the objectives specified in this section in accordance with terms of use set forth in the agreement entered into under this subsection; and

‘(B) shall be managed by the Administrator in accordance with regulations of the National Aeronautics and Space Administration.

‘(3) REQUIREMENTS WITH RESPECT TO AGREEMENTS- An agreement entered into with a covered entity under this subsection—

‘(A) shall address the terms of use, ownership, and disposition of the funds, services, or equipment contributed pursuant to the agreement; and

‘(B) shall include a provision that the covered entity will not recover the costs of its contribution through any other agreement with the United States.

‘(c) Annual Report- Not later than January 31 of each year, the Administrator of the National Aeronautics and Space Administration shall submit to its congressional oversight committees a report on the funds, services, and equipment accepted and used by the Administrator under this section during the preceding fiscal year.

‘(d) Regulations- The Administrator of the National Aeronautics and Space Administration shall prescribe regulations to carry out this section.

‘(e) Definitions- In this section:

‘(1) COVERED ENTITY- The term ‘covered entity’ means a non-Federal entity that--

‘(A) is organized under the laws of the United States or of any jurisdiction within the United States; and

‘(B) is engaged in commercial space activities.

‘(2) LAUNCH SUPPORT FACILITIES- The term ‘launch support facilities’ has the meaning given the term in section 50501(7) of title 51.

‘(3) SPACE RECOVERY SUPPORT FACILITIES- The term ‘space recovery support facilities’ has the meaning given the term in section 50501(11) of title 51.

‘(4) SPACE TRANSPORTATION INFRASTRUCTURE- The term ‘space transportation infrastructure’ has the meaning given that term in section 50501(12) of title 51.’.

(f) Clerical Amendment- The table of sections at the beginning of such chapter, as so amended, is further amended by adding at the end the following new item:

‘20148. Commercial space launch cooperation.’.

SECTIONAL ANALYSIS:

This proposal would provide a mechanism for the National Aeronautics and Space Administration (NASA) to support commercial space activities by providing greater access to launch property and services to the private sector, and allow NASA to accept funding from the private sector in order to develop, enhance, or maintain the U.S. Government's launch, range instrumentation, and reentry sites. This proposal would authorize NASA to accept non-federal funding only under strict implementation guidelines, which would be narrowly applied to space launch and base support services only.

With one exception, this proposal is identical to and provides NASA with the same authority provided to the Department of Defense under Section 912 of Public Law 112-239, the FY 2013 National Defense Authorization Act.⁶⁵

Failure to take action to provide NASA with the same authority to work with commercial partners as DoD risks creating uncertainty for commercial providers, contributes to the further erosion of NASA's space transportation infrastructure as compared to the DoD and places NASA at a disadvantage compared to DoD as it supports the development of a robust domestic space launch industry.

Under this proposal, NASA may include, with up-front commercial funding, commercial launch/base support requirements in NASA contracts. For example if a commercial launch provider could add its requirements and funding to existing NASA infrastructure support contracts, the government's purchasing power would be enhanced through the increase in the economies of scale, as well as the benefit from receiving the additional up-front funding from the commercial launch provider prior to contracting. Thus, this change would ensure our contracts are "right-sized" and no longer offered to commercial launch providers just on an "excess" capacity basis, which would result in synergistic operations and eliminate administrative impediments and bureaucracy. Commercial use of any/all NASA processing facilities to process both commercial and government payloads would result in efficiencies, better mission assurance, and cost savings for users.

Existing section 2273(c) of Title 10 instructs the Secretary of Defense to pursue the attainment of the capabilities necessary to launch and insert United States national security payloads into space "in coordination with the Administrator of the National Aeronautics and Space Administration" to the maximum extent practicable. DoD and NASA maintain continuing collaboration on many space-related activities, including significant agreements under the Economy Act for shared services and infrastructure. And both DoD and NASA launch and space recovery support facilities and ranges are challenged by escalating costs, eroding capabilities, and bureaucratic processes. These conditions not only impair DoD and NASA launch programs, but also impair DoD's and NASA's ability to support commercial space to the level of Congressional/Presidential intent. Because of the significant coordination and interdependencies between DoD and NASA's space programs, it is imperative that NASA be provided the same opportunities to meet the needs of the commercial sector and reduce the cost to the government.

This legislative change would provide NASA with the same abilities to address these needs by allowing the NASA and the commercial space sector to combine their requirements and funding within NASA contracts and allowing and NASA to purchase facilities and equipment

⁶⁵ Because NASA receives reimbursable budget authority in its annual appropriation, NASA does not require, and therefore does not seek, the authority provided to the DoD under subsection (d), which establishes the "Defense Cooperation Space Launch Account" to hold funds received under the new authority.

that can be shared and maintained on an equitable basis -- making the services and facilities available to each with the cost and availability efficiencies shared by all.

Budget Implications: The National Aeronautics and Space Administration (NASA) expects this proposal to be covered by existing civil servant labor, specifically within the plans and programs functions of the Human Explorations and Operations Mission Directorate (HEOMD). The work involved would be an extension of the administration, liaison, consultation, and planning functions already performed in conjunction with commercial and state entities doing business with the DoD space wings and HEOMD. Any cost is part of the FY 2014-2018 budget baseline and does not require additional funding from Congress. There would be no budgetary tradeoff to fund this proposal. Rather, the associated workload would be added to and compete with other assigned tasks for performance by appropriate personnel as priorities dictate.

The primary budget implication of this proposal is that it would permit NASA to accept contributions of funds, property, and services from non-federal entities to enable federal/nonfederal partnerships that benefit access to space and the development and vitality of the commercial space industry. It would not increase any NASA launch, range, or facility budget, but it could pave the way for cost savings or cost avoidance opportunities. The proposal would allow NASA and the commercial industry to share requirements and costs on a case-by-case basis, thereby creating quantity efficiencies for all. It does not mandate additional costs or generate guaranteed, measurable savings. It is an “enabling” authority for NASA launch and space recovery support facilities to enter into agreements with the commercial space industry, to save resources and add capability for all parties, but only when in the best interests of the government.

This proposal would enhance NASA’s authority to collaborate with non-federal entities to facilitate implementation of the NASA launch support and infrastructure modernization program. It also furthers NASA’s ability to collaborate with the Secretary of Defense in developing the additional capabilities necessary to support both government and commercial launch requirements. The specific mechanisms provided in the proposal are beneficial in that they permit non-federal entities to leverage government resources to support development of the United States domestic space industry.

Background on Proposal:

Since late 2010, NASA has collaborated with the Air Force on this proposed legislation to be included in the National Defense Authorization Act (NDAA), to ensure that it would provide NASA the same authorities being requested by the DoD to support commercial space activities. Due to the extensive coordination between the DoD and NASA in use of launch infrastructure and capabilities, it is imperative that both entities operate under the same authorities in this area. Commercial partners utilizing co-located DoD and NASA facilities need assurance that “the Government” will provide consistent and coordinated support.

During consideration of the NDAA in 2011, Armed Services Committee staff did not include this provision, either for DoD alone, or with the addition of NASA, due to Congressional staff unfamiliarity with the criticality, issues with Congressional Budget Office scoring, and an incorrect perception that only DoD authorities can reside in Title 10 of the US Code.

Given this history, the DoD submitted to the House and Senate Armed Services Committees (HASC/SASC) the Commercial Space Launch Cooperation authority without the inclusion of NASA. However, recognizing the close relationship between NASA and the Air

Force for co-located space launch facilities, the Air Force supports NASA seeking the same authority which the DoD recently received in Section 912 of Public Law 112-239, the FY 2013 National Defense Authorization Act. . On April 20, 2012, Air Force staff discussed the proposed authority with House and Senate Armed Services Committee staff and relayed that NASA oversight Committee staff may be speaking to them about supporting the proposed authority and including NASA in the provision.

NASA briefed staff for its authorization Committees in both the House and the Senate on this Authority in May, 2012. Ultimately, the authority was included (without NASA) in Section 912 of Public Law 112-239, the FY 2013 National Defense Authorization Act.

Chairman PALAZZO. The Subcommittee on Space will come to order. Good morning. Welcome to today's hearing titled "NASA Infrastructure: Enabling Discovery and Ensuring Capability." In front of you are packets containing the written testimony, biographies, and required Truth-in-Testimony disclosures for today's witnesses.

I recognize myself for five minutes for an opening statement.

The purpose of today's hearing is to address NASA's complex infrastructure issues. This is a tall order for an agency that is the ninth largest Federal Government real property holder. That includes an inventory of more than 124,000 acres, and more than 44 million square feet within approximately 4,900 buildings and other structures. However, nearly 80 percent of the agency's facilities date back to the Apollo era and are 40 or more years old. A 2012 study by NASA estimated that NASA may have as many as 865 unneeded facilities, with maintenance costs of over \$24 million a year. Also, NASA has a backlog of over \$2.19 billion in deferred maintenance.

In order to better manage its infrastructure and facilities, NASA has established an Agency Master Plan to align its infrastructure with its mission and set up a Technical Capabilities Assessment Study to identify and evaluate Center capabilities against Agency needs. Also, various Centers are implementing innovative ways to address these infrastructure challenges such as the Langley 20-Year Revitalization Plan to right-size the Center's facilities and bring about greater efficiencies. Despite these efforts, NASA will continue to face challenges with right-sizing its infrastructure as long as it does not have a coherent and consistent roadmap for exploration.

Since 2005, Congress has provided consistent guidance on how NASA should develop such a roadmap as well as the necessary funding on a go-as-you-can-pay basis. Despite our efforts, OMB and the recent Administration have chosen to divert resources from exploration to other efforts.

The President's 2009 cut of \$1 billion from the exploration budget, and the roughly 45 percent increase in the Earth Science budget since 2007 are just a few examples.

Until the Administration allows NASA to develop a coherent exploration strategy, rather than pushing NASA toward costly, complex and controversial distractions such as the Administration's asteroid proposals, NASA will never know what infrastructure and facilities it actually needs.

Setting aside this issue, I believe there are things that the Administration and Congress can do to allow NASA to better manage its facilities. NASA already has authorities to enter into Enhanced Use Lease agreements to maintain underutilized infrastructure, Space Act Agreements, traditional leases, and various other incentives.

I hope the witnesses will be able to discuss how NASA is using these existing authorities. Are they being fully utilized, and does NASA have robust policies to determine which authority should be used for each facility, and whether Agency oversight is sufficient to ensure fairness and protect taxpayer equities.

In addition to existing authorities, NASA and stakeholders have recommended various additional authorities such as conveyance authority, expanded Enhanced Use Lease, the establishment of a capital fund, and enhanced authority to cooperate with the commercial launch sector. While these proposals are promising, I believe that they must be accompanied by strong oversight provisions to ensure that taxpayer investments are protected.

While the NASA Authorization Act of 2013 funds key NASA missions, maintains infrastructure and even increases funding for Center Management and Operations, it does not attempt to solve all of the agency's complex infrastructure issues. Instead, we have allowed time for opportunities such as this hearing to gain better understanding of NASA's challenges and options. I hope that the insights we gain today will be useful as we move forward with the NASA Authorization Act.

I would be remiss if I did not mention the intense amount of interest that Members and stakeholders have in NASA's infrastructure. This is exhibited by the recent debates surrounding the Kennedy Space Center's Launch Complex 39A, the Shuttle landing facility, and the Shiloh site, as well as the Johnson Space Center's arc jet, cleanup of the Santa Susanna Site, test stand use at Stennis Space Center, as well as Hangar One and Moffett field at Ames Research Center, to mention just a few. I know many Members have opinions on these topics that directly impact their districts. I look forward to working with my colleagues, as well as NASA and the Administration to tackle these challenges.

[The prepared statement of Mr. Palazzo follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON SPACE CHAIRMAN STEVEN PALAZZO

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Chairman PALAZZO. With that, I yield to the Ranking Member, the gentlewoman Ms. Brownley.

Ms. BROWNLEY. Thank you, Mr. Chairman, for holding today's hearing to review NASA's infrastructure and facilities, and welcome to our witnesses. Ranking Member Edwards had another commitment this morning, and has asked me to sit in her chair, and I request that her prepared statement be entered into the record.

Ranking Member Edwards and I share the same passion for ensuring that NASA has a productive and inspiring future. However, a strong and vibrant space program requires that we provide NASA with adequate resources, including the R&D tools and facilities it needs to accomplish its challenging missions and cutting edge research.

I am concerned about the state of the agency's facilities and infrastructure. The fact that NASA's facilities are aging should come as no surprise. Many were built during and before the Apollo era. Today, challenged by both declining funding and an uncertain budgetary environment, NASA is trying to make due with what it is given. In that regard, I am especially concerned about adequately funding NASA's Environmental Compliance and Restoration Program, which is responsible for cleaning up hazardous materials and waste that have been released to the surface or groundwater at NASA installations, NASA-owned industrial plants supporting NASA activities, current or former sites where NASA operations have contributed to environmental problems, and other sites where the Agency is legally obligated to address hazardous pollutants.

According to NASA's Fiscal Year 2014 budget requests, one of the projects planned includes investigation and clean up of contaminated groundwater, soils, and demolition at Santa Susana Field Laboratory in accordance with a consent order with the State

of California. This and other planned environmental compliance restoration activities have been the result of painstaking negotiations between NASA and several States.

That is why I hope to learn more about the status of NASA's actions at Santa Susanna, and about what is needed to address NASA's other longstanding facilities and infrastructure challenges.

NASA's successes are a shining light of inspiration and accomplishment for our youth and our Nation, and I want to ensure that we enable NASA to continue to fill that role in the coming years.

Thank you, Mr. Chair, and I yield back.

[The prepared statement of Ms. Brownley follows:]

PREPARED STATEMENT OF SUBCOMMITTEE ON SPACE ACTING RANKING MINORITY
MEMBER JULIE BROWNLEY

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Chairman PALAZZO. Thank you. Thank you, Ms. Brownley. If there are Members who wish to submit additional opening statements, your statements will be added to the record at this point.

Chairman PALAZZO. If there are Members who wish to submit additional—actually, at this time I would like to introduce our panel of witnesses. Our first witness is the Honorable Paul Martin, the Inspector General of the National Aeronautics and Space Administration. Our second witness is Mr. Richard Keegan, NASA's Associate Deputy Administrator. As our witnesses should know, spoken testimony is limited to five minutes each, after which Members of the Committee have five minutes each to ask questions. Your written testimony will be included in the record of the hearing.

I now recognize our first witness, Mr. Martin, for five minutes.

**TESTIMONY OF THE HONORABLE PAUL K. MARTIN,
INSPECTOR GENERAL,
NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION**

Mr. MARTIN. Thank you, Mr. Chairman. Chairman Palazzo, Congresswoman Brownley, and Members of the Subcommittee, the Office of Inspector General welcomes this opportunity to discuss the challenges facing NASA with respect to its aging infrastructure and antiquated facilities.

Over the past three years, we have issued 10 audits examining many of NASA's most pressing infrastructure-related issues. In my remarks this morning, I will focus primarily on our February audit that assessed NASA's efforts to reduce its unneeded infrastructure.

As mentioned, NASA is the ninth largest Federal Government property holder, controlling approximately 4,900 buildings and structures, more than 80 percent of which are over 40 years old and beyond their design life. However, NASA has not been able to properly fund required maintenance for its facilities, and estimates its deferred maintenance costs at \$2.3 billion.

In our February audit, we identified 33 facilities, wind tunnels, test stands, thermal vacuum chambers, air fields, and launch infrastructure, that NASA was not fully utilizing or for which managers could not identify a future mission use. These facilities cost more than \$43 million to maintain in 2011 alone. The need for these facilities has declined as a result of their poor condition, changes in NASA's mission, and the advent of alternative testing methods. We found that NASA's attempts over the years to address its infrastructure problems have met with limited success. Our audit identified four reasons why.

First, Fluctuating and Uncertain Requirements. Changes to national space policy initiated by the President and Congress have increased the difficulty of determining which facilities NASA needs. For example, NASA's human exploration mission has transitioned from the Space Shuttle Program to the Constellation Program to the Space Launch System in just six years. Because decisions about whether to retain specific facilities depends heavily upon the missions that NASA undertakes, frequent changes to these missions complicate the Agency's efforts to manage its infrastructure.

A recent example is the A-3 test stand at Stennis, which was constructed to accommodate special testing requirements for the J2-X engine. When Constellation was cancelled in 2010, the test stand was approximately 65 percent complete. Because neither the Space Launch System nor any other existing or planned NASA program requires the A-3's capabilities, NASA plans to mothball the \$350 million test stand later this month once it is completed. Even so, maintenance costs for the mothballed stand may reach \$1.5 million annually.

Second, Agency Culture and Business Practices. Historically, NASA has practiced a decentralized approach to managing its infrastructure, leading Centers to compete for work from the Agency's major programs. A "keep it in case you might need it" culture has led Centers to either build or preserve facilities that duplicate

capabilities elsewhere in the Agency. For example, NASA currently has 36 wind tunnels at 5 Centers, 35 rocket test stands at 6 sites, and 40 large thermal vacuum chambers at seven locations.

Third, Political Pressure. The political context in which NASA operates often impedes its efforts to reduce infrastructure. During our review, we noted several examples where political leaders intervened in NASA's plans to close or consolidate Agency facilities. For example, Members of Congress opposed NASA's decision to consolidate arc jet operations at Ames, and in another matter, argued against NASA's efforts to relinquish control of Hangar One at Moffett Field. While input from federal, state, and local officials is not unique to NASA, such pressure creates additional difficulties as the Agency seeks to manage its aging infrastructure.

Finally, Inadequate Funding. Disposing of facilities that NASA no longer needs is not without cost, and in many instances, requires environmental remediation. For example, under the terms of its current agreement with California, NASA estimates that the environmental cleanup at the Santa Susana Field Laboratory will cost more than \$200 million. Consequently, NASA's ability to reduce its infrastructure depends on funding for cleanup and other costs associated with demolition and disposal.

NASA officials readily acknowledge that the Agency has more infrastructure than it needs to carry out current and planned missions, and to its credit NASA has a series of initiatives underway that we believe are positive steps toward right sizing its real property footprint. However, many of these efforts are in the early stages and their ultimate success remains unclear.

In the end, NASA's best efforts to reduce its excess facilities may be insufficient to overcome the cultural and political obstacles that have impeded past efforts. Accordingly, an outside process similar to the DoD's Base Realignment and Closure Commission may be needed to help make the difficult but necessary—infrastructure decisions.

Thank you very much.

[The prepared statement of Mr. Martin follows:]

Testimony before the Subcommittee on Space
Committee on Science, Space, and Technology

United States House of Representatives

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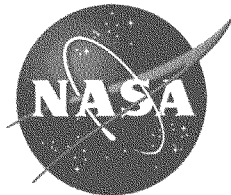
**NASA Infrastructure:
Enabling Discovery and
Ensuring Capability**

Statement of

Paul K. Martin

Inspector General

National Aeronautics and Space Administration



Chairman Palazzo, Ranking Member Edwards, and Members of the Subcommittee:

The Office of Inspector General (OIG) is committed to providing independent, aggressive, and objective oversight of NASA, and we welcome this opportunity to discuss the challenges facing the Agency with respect to its aging infrastructure and antiquated facilities.

For the past 3 years, the OIG has identified “Infrastructure and Facilities Management” as one of NASA’s top management and performance challenges – and we expect it to remain a top challenge for many years to come. During this period, the OIG has issued 10 audit reports examining many of NASA’s most pressing infrastructure-related issues, ranging from demolishing or leasing unused facilities to remediating environmental contamination at rocket test sites. In my testimony this morning, I will focus primarily on a February 2013 audit that assessed NASA’s efforts to reduce its unneeded infrastructure and facilities.

NASA’s Aging Infrastructure

NASA is the ninth largest Federal Government property holder, controlling approximately 4,900 buildings and structures with an estimated replacement value of more than \$30 billion. More than 80 percent of the Agency’s facilities are 40 or more years old and beyond their design life. However, NASA has not been able to fully fund required maintenance for its facilities and in 2012 estimated its deferred maintenance costs at \$2.3 billion. Moreover, a 2012 Agency study estimated that NASA may have as many as 865 unneeded facilities with associated annual maintenance costs of more than \$24 million.

One way NASA could reduce its facilities maintenance costs would be to reduce the amount of unneeded infrastructure in its inventory. However, to be successful in this effort NASA must move beyond its historic “keep it in case you need it” approach of managing its facilities.

In our February 2013 audit, we identified 33 facilities that NASA was not fully utilizing or for which Agency managers could not identify a future mission use, facilities that cost more than \$43 million to maintain in fiscal year (FY) 2011 alone. The need for these facilities has declined in recent years as a result of changes in NASA’s mission, their poor condition and obsolescence, and the advent of alternative testing methods.

The 33 facilities include:

- Wind Tunnels: At least 6 of NASA’s 36 wind tunnels were underutilized or NASA managers could not identify a future mission use. NASA’s use of wind tunnels has declined in recent years due to a reduction in the Agency’s aeronautics budget, fewer new aircraft developments by the Department of Defense and private industry, newer and more capable foreign testing facilities, and alternative testing methods such as computational fluid dynamics.
- Test Stands: As many as 14 of the Agency’s 35 rocket engine test stands were underutilized or NASA managers could not identify a future mission use. NASA’s use of test stands has declined in recent years primarily due to a lack of new, large-scale

propulsion test programs. The ongoing development of the heavy-lift rocket associated with NASA's Space Launch System is not expected to alter this trend.

- Thermal Vacuum Chambers: At least 4 of the Agency's 40 large thermal vacuum chambers were underutilized or NASA managers could not identify a future mission use. NASA's use of the chambers has declined in recent years due to a lack of need by NASA programs and the poor condition of some chambers.
- Airfields: Two of the Agency's three airfields – Moffett Federal Airfield at the Ames Research Center (Ames) and the Shuttle Landing Facility at the Kennedy Space Center (Kennedy) – were underutilized or NASA managers could not identify a future mission use. The Ames airfield almost exclusively supports non-NASA entities while the Kennedy facility supports non-NASA space hardware deliveries. The Kennedy facility was last used for a NASA mission in September 2012 by the plane carrying Space Shuttle Endeavour to its final home at the California Science Center.
- Launch Infrastructure: Seven of NASA's launch-related facilities at Kennedy were underutilized or NASA managers could not identify a future mission use, including solid rocket booster recovery facilities, a parachute refurbishment facility, a launch pad, and one Orbiter Processing Facility. NASA's need for this infrastructure ended with retirement of the Space Shuttle Program, and timely decisions are needed in light of high maintenance costs. To their credit, Kennedy managers have leased one Orbiter Processing Facility and are seeking commercial companies to lease several other sites, including launch pad 39A.

While NASA officials agreed that these 33 facilities are unused or at best underused, the consensus breaks down when searching for a way forward. In our February 2013 audit, we identified four interrelated challenges that historically have hindered NASA's inability to comprehensively address its infrastructure problems:

Fluctuating and Uncertain Requirements

Changes to the Nation's space policy initiated by Congress, the President, and NASA have increased the difficulty of determining which facilities the Agency needs in order to accomplish its missions. For example, NASA's human exploration mission has transitioned from the Space Shuttle Program to the Constellation Program to the Space Launch System in just 6 years. Because decisions of whether to retain, consolidate, or dispose of specific facilities depends heavily upon the missions NASA undertakes, frequent changes to those missions complicates the task of managing the Agency's infrastructure.

An example of this challenge is the Agency's experience with the A-3 test stand at the Stennis Space Center (Stennis), which was constructed to accommodate special testing requirements associated with rockets being built for NASA's Constellation Program. When Constellation was cancelled in 2010, the test stand was approximately 65 percent complete. Rather than suspend construction of the stand (which has no current utility other than for testing the specific engines that were being developed for the since-cancelled rocket), NASA was directed by Congress to

complete construction at a total cost of nearly \$350 million. Because neither the Space Launch System nor any other existing or planned NASA program requires the A-3's capabilities, NASA plans to mothball the test stand when construction is completed later this month. Even so, the maintenance costs of the mothballed A-3 test stand will exceed \$1.5 million annually.

Agency Culture and Business Practices

Historically, NASA has practiced a decentralized approach to managing its infrastructure, leading Centers to compete for work from the Agency's major programs and rewarding a "keep it in case you need it" philosophy. This culture has fostered a propensity for Centers to build or preserve facilities that duplicate capabilities available elsewhere in the Agency or lack an identified mission use. For example, NASA currently has 36 wind tunnels at 5 Centers, 35 rocket test stands at 6 sites, and 40 large thermal vacuum chambers at 7 locations.

Political Pressure

The political context in which NASA operates often impedes its efforts to reduce infrastructure. During our 2013 audit, we noted several examples where political leaders intervened in plans to close or consolidate Agency facilities. For example, members of Congress opposed NASA's decision to consolidate the Agency's Arc Jet operations at Ames, directed completion of the A-3 test stand at Stennis even though the engine for which it was built had been cancelled, and contested the Agency's decision to seek alternatives for the future use of Hangar One and Moffett Federal Air Field at Ames. While input from Federal, state, and local officials is not unique to NASA, such pressure creates additional difficulties for the Agency as it seeks to manage its aging infrastructure.

Inadequate Funding

Demolishing or disposing of facilities that NASA no longer needs is not without cost and in many instances NASA must conduct environmental remediation before it can dispose of a facility. For example, under the terms of its current agreement with California, NASA estimates that the environmental cleanup of its Santa Susana Field Laboratory will cost more than \$200 million. Accordingly, the Agency's ability to reduce its real property footprint depends in large part on funding for cleanup and other costs associated with demolition and disposal. However, in this era of constrained Federal budgets the amount of money dedicated to these activities is not likely to increase. In fact, in FY 2012 the Office of Management and Budget reduced NASA's proposed recapitalization budget for renewing and replacing facilities for FYs 2013 through 2017 by more than \$900 million or approximately 60 percent.

NASA Initiatives to Manage its Infrastructure

NASA has several promising initiatives underway to manage its infrastructure, including organizational changes, a new facilities strategy, an analytical framework for making infrastructure decisions, and improvements in managing its real property data. The development of an Agency Facilities Strategy and Integrated Master Plan, capability assessments, and organizational changes to centralize decision authority over infrastructure matters should better

position the Agency to strategically assess infrastructure needs, manage underutilized property, and divest itself of facilities that are duplicative or unneeded.

While we view these initiatives as positive steps, most are in the early stages of development and, as noted previously, NASA has attempted infrastructure reduction initiatives in the past with limited success. Absent strong and sustained leadership to see its current efforts through and incorporate them into Agency policy, we are concerned that these latest efforts will meet a similar fate.

In an August 2012 audit examining NASA's leasing practices, we found that while NASA has made improvements to its leasing program in recent years, the Agency faces significant challenges in maximizing the benefits of its leasing program. Leasing unneeded facilities offers NASA another means to help address maintenance costs associated with its aging and underutilized facilities; however, Federal law and policy prohibit NASA from leasing facilities for which it has no current or future mission-related use.

In addition, we found that NASA lacked clear guidance to ensure that property identified for leasing had a current or future mission use, a complete inventory of space available for lease as well as an effective marketing program to attract potential tenants, internal controls to ensure that its leases provide the best value to NASA and are fair to potential partners, and guidance to ensure that in-kind consideration that it accepts as part of a leasing arrangement benefits NASA. Absent better controls and improved guidance, we concluded that it would be difficult for NASA to maximize the full potential of its leasing program to help reduce the cost of maintaining underutilized facilities while meeting its obligation to ensure that leasing does not become a substitute for disposing of excess property.

Instead, we concluded that NASA should consider other options for these facilities such as demolition or reporting the property to the General Services Administration for sale or transfer to another entity. The challenge for NASA is to use leasing when appropriate to generate revenue to offset facilities operations and maintenance costs but not use it as a way to hold on to facilities the Agency does not need. As NASA considers expanding its leasing agreements to help manage its infrastructure challenges, the OIG encouraged the Agency to strengthen its guidance, training, and documentation requirements to ensure it is receiving the highest possible benefits from its lease agreements and that the agreements are made in the most transparent manner to ensure fairness to all parties.

Conclusion

NASA officials readily acknowledge that the Agency has more infrastructure than it needs to carry out current and planned missions. To its credit, NASA has a series of initiatives underway that we believe are positive steps towards "rightsizing" its real property footprint. The development of an Agency Facilities Strategy and Integrated Master Plan, capability assessments, and organizational changes to centralize decision authority over infrastructure matters should better position the Agency to strategically assess infrastructure needs, manage underutilized property, and divest itself of facilities that are duplicative or **unneeded**. However,

many of these efforts are in the early stages and their ultimate effect on the Agency's ability to reduce its real property portfolio remains unclear.

Given the disparity between the Agency's infrastructure and its mission-related needs, as well as the likelihood of continued constrained budgets, it is imperative that NASA move forward aggressively with its infrastructure reduction efforts. In doing so, the Agency will need to move away from its longstanding "keep it in case you need it" mindset and overcome historical incentives for the Centers to build up and maintain unneeded capabilities. In addition, NASA officials need to manage the concerns of political leaders about the impacts eliminating or consolidating facilities will have on Centers' missions, their workforces, and the local communities. Moreover, abrupt changes in the strategic direction of the Nation's space policy by Congress, the President, and NASA will continue to add an element of uncertainty regarding the missions the Agency will pursue and therefore the facilities it will need to achieve those missions.

Against this complicated backdrop, successfully rightsizing NASA's real property footprint will require a sustained commitment from Agency leaders to see its ongoing infrastructure-related initiatives through to completion. Specifically, they must ensure that these initiatives are institutionalized, coordinated, and communicated both inside and outside the Agency. In addition, they must be willing to make the difficult decisions to divest unneeded infrastructure; effectively communicate those decisions to stakeholders; and withstand the inevitable pressures from Federal, state, and local officials.

We acknowledge that NASA's best efforts to address these challenges may ultimately be insufficient to overcome the cultural and political obstacles that have impeded past efforts to reduce Agency facilities. Accordingly, an outside process similar to the Department of Defense's Base Realignment and Closure Commission may be necessary to make the difficult but necessary infrastructure decisions.

I am hopeful that the OIG's ongoing work on these issues will contribute to a dialogue between the Administration and the Congress about NASA's future priorities and lead to enactment of realistic budgets that will enable the Agency to accomplish its multifaceted missions while appropriately managing its aging infrastructure.

Thank you.

Recent OIG Reports Examining NASA's Infrastructure Challenges

- NASA's Management of Energy Savings Contracts (April 8, 2013)
- NASA's Explosives Safety Program (March 27, 2013)
- NASA's Environmental Remediation Efforts at the Santa Susana Field Laboratory (February 14, 2013)
- NASA's Efforts to Reduce Unneeded Infrastructure and Facilities (February 12, 2013)
- NASA's Plans for the Ares I Mobile Launcher (September 25, 2012)
- NASA Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices (August 9, 2012)
- NASA Infrastructure and Facilities: An Assessment of the Agency's Real Property Master Planning (December 19, 2011)
- NASA Infrastructure and Facilities: Assessment of Data Used to Manage Real Property Assets (August 4, 2011)
- NASA's Hangar One Re-siding Project (June 22, 2011)
- Audit of NASA's Facilities Maintenance (March 2, 2011)



Paul K. Martin
NASA Inspector General
Biography

Paul K. Martin was confirmed by the United States Senate as NASA Inspector General on November 20, 2009.

Prior to his NASA appointment, Martin served as the Deputy Inspector General at the U.S. Department of Justice, Office of the Inspector General (OIG). In that capacity, he assisted the Inspector General in managing the audit, inspection and investigative activities of the office's 425 employees. From 2001 to 2003, he served as Counselor to the Inspector General, and from 1998 to 2001 he served as Special Counsel to the Inspector General.

Before joining the Department of Justice OIG, Martin spent 13 years at the U.S. Sentencing Commission in a variety of positions, including 6 years as the Commission's Deputy Staff Director. Martin was one of the Sentencing Commission's first employees when the agency was created in 1985, and helped develop the first set of federal sentencing guidelines.

Martin began his professional career as a reporter with The Greenville News, a daily newspaper in Greenville, S.C. He holds a B.A. in Journalism from The Pennsylvania State University and a Juris Doctor from The Georgetown University Law Center.

Chairman PALAZZO. Thank you, Mr. Martin.
I now recognize our next witness, Mr. Keegan, for five minutes.

**TESTIMONY OF MR. RICHARD KEEGAN,
ASSOCIATE DEPUTY ADMINISTRATOR,
NATIONAL AERONAUTICS
AND SPACE ADMINISTRATION**

Mr. KEEGAN. Chairman Palazzo and Members of the Subcommittee, thank you for the opportunity to appear before you today to discuss NASA's continuing efforts to balance and align the Agency's infrastructure goals with today's evolving mission requirements.

Every day, NASA scientists and engineers achieve tremendous advances in the areas of human space flight, Earth Science, space science, aeronautics research, and space technology, inspiring people worldwide. These achievements would not be possible without access to reliable and cost effective physical infrastructure capabilities located across the country at NASA's 10 Centers and their associated facilities. NASA takes seriously its responsibility to be an effective steward of these capabilities, ensuring they are effective and available as needed for our current and future missions.

Like other Federal agencies, NASA is challenged with managing the significant needs of an aging physical infrastructure portfolio within a budget environment that can be difficult to predict. NASA's infrastructure was largely constructed during or before the Apollo era. While our facilities are generally well-designed and constructed, age and changing mission requirements have affected the resilience and usefulness of many of our facilities. Yet in spite of these challenges, NASA continues to make significant progress on achieving our overarching facility strategy. For example, each NASA Center has one or more major facility replacement projects underway at the planning, design, or construction stage.

NASA is pursuing public and private sector utilization opportunities for assets that are excess to its needs. An example is the recent agreement between NASA and Space Florida for the use of Orbital Processing Facility 3 at Kennedy Space Center. Another such opportunity is the ongoing competition regarding Kennedy's Launch Complex 39A. Given that this is an ongoing competition, it would be inappropriate for me to comment further on this particular matter today.

Agency-deferred maintenance, an estimate of the essential but unfunded maintenance work necessary to bring all facilities up to standards, has decreased by 5.7 percent since 2011. The utility system replacement projects at our NASA Centers are underway, reducing the risk of major utility failures that could impact Agency operations, and the number of real property assets owned and maintained by NASA continues to decrease, thereby freeing up infrastructure dollars for other projects. NASA estimates that it will reduce administrative space by another 256,000 square feet by the year 2015 via demolition, transfer, or lease termination.

Today, NASA's infrastructure decisions are guided by an Agency facility strategy defined in 2009, along with a 20-year Agency master plan that informs implementation of this strategy. NASA has also established an Agency level mission support council to inte-

grate senior management review of decisions within the mission support portfolio, ensuring that mission requirements and facility investment are better aligned. Additionally, we have established a collaborative partnering arrangement between center and headquarters officials in order to ensure facility strategic goals are realistic, based on budget availability.

In July, 2012, NASA stood up a Technical Capability Assessment Team, or TCAT, under the leadership of the Associate Administrator that was charged with developing a process for identifying and assessing each Center's technical capabilities against the current and future needs of the Agency. The team was also asked to identify areas for potential capability divestment or investment, due to changing mission needs and/or duplication of capabilities. Once complete, the team's analysis will be used from a facilities perspective to inform future Agency master planning activities, and to support future strategic facility investment decisions.

In summary, NASA believes that our strategic infrastructure approach, aligned with mission requirements and guided by a well-integrated risk management practice provides the best framework for achieving the Agency's infrastructure goals in the most cost effective manner over time. We therefore appreciate this Subcommittee's continued support for NASA programs and priorities, and for the funding NASA needs to maintain, protect, and improve our Nation's valuable Space and Aeronautics Program infrastructure. I will be pleased to answer any questions you may have.

[The prepared statement of Mr. Keegan follows:]

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BY WITNESS
September 20, 2013

Statement of

Richard Keegan
Associate Administrator
Mission Support Directorate
National Aeronautics and Space Administration

before the

Subcommittee on Space
Committee on Science, Space, and Technology
U.S. House of Representatives

Chairman Palazzo, Ranking Member Edwards, and Members of the Subcommittee, thank you for the opportunity to appear today to discuss NASA's infrastructure planning and implementation, and continuing efforts to balance and align the Agency's infrastructure management goals with evolving mission requirements.

To inspire the Nation through its pursuit of ambitious goals for human space exploration, Earth and space science research, and aeronautics research, NASA must steward reliable, cost-effective physical infrastructure capabilities that fully support the requirements of its missions and programs. In order to sustain these capabilities, the Agency is challenged with managing the significant needs of an aging physical capital portfolio, largely constructed during or before the Apollo era, many configured to past needs, and in declining condition. Though NASA facilities are generally well-designed and constructed, age and changing mission requirements have affected the resilience and usefulness of many facilities.

NASA has not ignored these circumstances, and in recent years, has made measurable strides on a path toward a strategic, rather than tactical, approach to achieving a sustainable infrastructure portfolio. As a result, infrastructure management decisions are guided by an Agency Facilities Strategy, defined in 2009, which established that "NASA will renew and modernize its facilities to sustain its capabilities, and to accommodate those capabilities in the most efficient facilities set practicable." (This is often referred to as the Similar Capabilities, Smaller Footprint strategy.) Further, NASA now has a coordinated 20-year Agency Master Plan to inform implementation of the Facilities Strategy. Governance improvements, such as the establishment of an Agency-level council, now known as the Mission Support Council, to afford integrated senior management review of decisions within the mission support portfolio, have strengthened mission alignment and facilities investment effectiveness. Planning partnerships are in place between NASA Centers and Headquarters to develop and implement strategic facilities goals. While specific targets will change in response to evolving budget constructs, NASA believes that

a strategic approach, aligned with mission requirements and guided by well-integrated risk management practices, provides a valid framework for achieving these goals over time.

Additionally, NASA is committed to the maturation of its process to assess Agency-wide technical capabilities in an objective, comprehensive manner, in order to retain and support only those assets necessary to fulfill current and future mission needs. To increase efficiency with existing resources, NASA is assessing critical capabilities and identifying areas of investment, divestment, or duplication throughout the Agency, as well as evaluating and leveraging other Agency and private sector assets, when available. Effective management of NASA technical capabilities is essential to the success of all NASA current and future programs. Under the authority of the NASA Associate Administrator, NASA has assembled the Technical Capabilities Assessment Team. This team has developed a process for a comprehensive technical capability assessment which will identify and evaluate Center technical capabilities against the current and future needs of the Agency. This comprehensive assessment began in July 2012 and evaluates Center capabilities against Agency strategic goals and long-term needs. The outcomes of this ongoing process will inform NASA's master planning activities and support strategic facilities investment decisions.

NASA Master Planning:

Recognizing the need to more closely align real property assets with evolving mission needs, NASA defined its first Agency Facilities Strategy in 2009 and initiated substantial changes to its master planning processes. Agency real property management policies were revised and, by 2010, each NASA Center had updated its 20-year facilities plan. NASA integrated these updates into its first Agency-level master plan in 2011. Issued early in 2012, the Agency Master Plan represents an integrated Agency-level facilities planning framework. In alignment with the "Similar Capabilities, Smaller Footprint" strategy, the revised master planning process enables NASA to set broad real property objectives, to baseline metrics that track key outcomes (i.e., readiness to accomplish NASA's mission and consolidation toward an efficient "footprint"), and to monitor Center and Agency progress against its objectives.

Given that any completed plan is a "snapshot in time" that responds to circumstances that may change, the master planning process is an essential, continuing strategic tool for aligning real property assets with evolving mission requirements and technical capabilities needs. Evolving strategic circumstances, such as resource levels and a growing understanding of the nature and severity of potential climate and extreme weather risks, bear careful consideration in evaluating the suitability of current plans. NASA facilities management policy encourages Centers to update local plans as the delta between plans and forward expectations grows; at present, such updates are currently in progress at NASA's Kennedy Space Center (KSC) and Langley Research Center (LaRC). As such, Agency master plans and master planning processes are well aligned with current needs. For instance, master planning has contributed to the Agency's effective response to emerging Federal mandates such as the Administration's "Freeze the Footprint" policy, established in OMB Memorandum M-12-12, "Promoting Efficient Spending to Support Agency Operations."

NASA Facilities Planning Implementation

NASA's facilities investments decisions are distilled from the outcomes of Center and Agency master planning, as well as ongoing cross-Agency initiatives to assess and optimize Agency capabilities in the context of current and future requirements. Further, NASA is committed to the alignment of its capital investment plans for new facilities with Federal strategic sustainability goals established in Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance."

NASA endeavors to achieve its goals of sustaining its core capabilities in an affordable way that is consistent with the current budget climate. To this end, NASA uses risk assessments to filter and prioritize critical repairs, balancing critical repair investments against strategic investments that will modernize facilities and reduce operating costs. Additionally, the Agency periodically reassesses master plans and capital investment plans to ensure that they meet NASA's most critical needs within budget constraints.

NASA is consolidating, modernizing, and revitalizing its infrastructure as part of the overall NASA facilities strategy. Projects such as the Central Office Building at the Glenn Research Center (GRC), the Facility Support Center at the Dryden Flight Research Center (DFRC), the Integrated Services Building at the Langley Research Center (LaRC), and the Consolidated Engineering Building at the Marshall Space Flight Center (MSFC) have provided modern, efficient, sustainable facilities. These projects enabled the Centers to consolidate functions into smaller footprints, and facilitated the disposal of many old, costly facilities. NASA's program to replace its system of radar antennas over time will establish a modern space communications and navigation infrastructure that will meet NASA's needs for the foreseeable future. Replacement of distribution systems, such as the high pressure industrial water system at the Stennis Space Center, the East Test Area industrial water system at MSFC, and the replacement of electrical distribution systems at the Jet Propulsion Laboratory, the Kennedy Space Center (KSC) and DFRC will ensure that critical electrical and water systems that directly support research testing and flight operations will be reliable and ensure safe operations.

In 2014, NASA will revitalize and modernize the research aircraft integration facility at DFRC, and revitalize the central compressed air system at GRC, serving all GRC labs and wind tunnels. NASA's near-term planning responds to concerns identified in the National Research Council Report, *Capabilities for the Future – An Assessment of NASA Laboratories for Basic Research* (May 2010). NASA is evaluating the replacement of several laboratories that will support the Agency's future research needs.

NASA's Construction and Environmental Compliance and Restoration (CECR) budget supports the implementation of the Agency's facilities planning efforts. The CECR budget focuses on six major objectives:

Facility repairs and upgrades – These projects make facility repairs needed to mitigate near-term risks to missions and operations by repairing electrical, mechanical, life safety, and utility systems. Requirements are prioritized using risk assessments to identify the most critical repair needs.

Modernization, replacement and consolidation – These are major repair-by-replacement or -refurbishment projects that implement NASA's "Similar Capabilities, Smaller Footprint"

strategy. Using Center master plans as a basis, NASA establishes its capital investment planning, which identifies near-term projects that renew core capabilities in support of the Agency's strategic goals. The projects replace old, obsolete, failing facilities with new, sustainable, flexible, energy-efficient facilities. These new facilities consolidate functions, which increases building density (reduces footprint) and improves work efficiency and collaboration. Analysis of some of NASA's replacement facilities after they had been occupied determined that the Agency is achieving 41-55-percent utility savings in these buildings (97 percent in NASA's net-zero energy building) and 40 percent in operations savings. In addition, complete replacement of water and electrical distribution systems eliminates reliability problems with aging critical infrastructure. NASA has completed 13 consolidation and replacement facilities since 2011.

Energy Savings Investments – Beginning in 2014, NASA will establish an energy savings investment line in the CECR budget. This line will be used to invest in projects that reduce energy consumption, improve energy efficiency, reduce utility bills, and increase renewable energy production. NASA recognizes rising energy costs as a risk to its missions and operations. Although the Agency has been successful in reducing its energy consumption, rising energy prices continue to cut deeper into NASA's Center Management and Operations budget. This program will improve NASA's ability to control the impact of the rising cost of energy.

In addition to the new energy savings investment line in CECR, NASA has been investing 35 percent of its Enhanced Use Lease (EUL) net proceeds in energy-saving projects. NASA has used these funds to retro-commission buildings to reduce energy consumption, install energy-efficient lighting, and replace boilers with energy-efficient/low-emission boilers. As EUL proceeds increase, NASA will expand this program.

Environmental Compliance and Restoration – NASA's Environmental Compliance and Restoration (ECR) program cleans up hazardous materials and wastes that have been released to the surface or into groundwater at NASA installations, NASA-owned industrial plants supporting NASA activities, current or former sites where NASA operations have contributed to environmental problems, and other sites where the Agency is legally obligated to address hazardous pollutants. NASA uses a risk-based approach, assessing safety and health risk, mission impact and compliance requirements to prioritize environmental restoration plans within available resources.

The Environmental Compliance and Restoration program supports NASA's goal of conducting its mission in a sustainable way with reduced impact on the environment. The program supports methodologies for sustainably reducing energy intensity and greenhouse gas emissions, and supporting operational activities by ensuring that advances in chemical risk management are incorporated early in mission design phases. For example, the program supports developing national and international agreements to qualify citric acid for passivation of stainless steel, testing environmentally friendly corrosion coatings for launch structures, and qualifying solvent alternatives for precision-cleaning processes.

Demolition – NASA's demolition program eliminates obsolete, unneeded infrastructure to improve efficiency and eliminate safety and environmental risks. The program began in 2004, and has been an important part of NASA's plans to reduce its infrastructure and operating costs. In 2012, NASA demolished or disposed of 96 facilities. This eliminated \$2.6 million in

operations and maintenance requirements and \$15.8 million in deferred maintenance. NASA has maintained a five-year backlog of demolition projects since the start of the program. NASA reassesses its demolition requirements annually, with approximately a year of new demolition requirements added every year.

In addition to demolition, NASA is eliminating unneeded facilities through transfer to other Agencies or sale through the General Services Administration (GSA). Recently, NASA worked with GSA to successfully sell two large office buildings and land at the Glenn Research Center (GRC). This eliminated the cost and burden to NASA while making serviceable buildings available to industry in a location that has ideal access to the Cleveland airport. NASA will continue to explore the disposition of land and structures through sale when it is economically feasible. NASA is also actively removing leased space from its inventory. In 2012, NASA closed leases that resulted in a savings of just over \$1 million in rent.

Programmatic Construction of Facilities (CoF) – Programmatic CoF provides capabilities in testing and development that directly support NASA’s current missions. These projects modify NASA facilities to provide specific technical requirements to manufacture, test, process, or operate hardware for NASA programs. These projects are identified by NASA flight and research programs as specific changes to NASA technical capabilities essential to the success of NASA programs. Programs must assess and prioritize their facilities requirements against other program requirements to determine the size and timing of their facilities program. A NASA real property management goal is to only construct and operate new real property when existing capabilities cannot be used or modified. Programs are required to conduct trade studies before programming a facility project to determine if existing facilities can be used. Investments above \$20 million are reviewed by a NASA management council to ensure that programs are constructing facilities only when necessary.

NASA Real Property Management Authorities:

NASA has several Federal authorities available to support its real property and infrastructure management goals. The Agency’s use of this complement of authorities depends upon the status of a given property’s utilization within the real property portfolio (i.e., whether the property has been administratively determined to be excess to NASA mission needs, for instance, or is not excess, but underutilized.) Depending on the desired end state for the property, NASA can dispose of excess property through the GSA excess process or demolish excess property through delegated authority from GSA. GSA’s Public Benefit Conveyance and Exchanging Building for Services authorities offer additional avenues for disposing of excess properties.

Opportunities for beneficial reutilization—as well as revitalization—of underutilized properties may be realized through the use of Federal out-grant authorities under the National Aeronautics and Space Act (“Space Act”), the National Historic Preservation Act, the Economy Act, and the Commercial Space Launch Act (CSLA). The Space Act provides NASA the authority to enter into a variety of agreements, both reimbursable and non-reimbursable, including licenses, use permits, memoranda of understanding and concessionaire agreements. Amendments to the Space Act beginning in 2003, with subsequent expansion and amendment, provided NASA authority to enter into Enhanced Use Leases (EULs, thereby enabling the Agency to collect and

retain fair-market value proceeds from utilization of underutilized property by commercial or other entities, which may be used for maintenance, capital revitalization, and/or improvements to real property assets. The CSLA authorizes the Federal government to “facilitate and encourage the acquisition by the private sector...of launch or reentry property of the United States Government that is excess or not otherwise needed for public use....” Under the CSLA, NASA charges only its direct costs, which are those costs that NASA would not otherwise incur absent the partnership activity. By entering into these agreements with public and private sector entities, currently underutilized NASA facilities may be leveraged into more productive properties, maximizing asset utilization and efficiency.

NASA Facilities Strategy Results

In spite of budget challenges, NASA is making progress on its facility strategy. Major replacement facilities are in planning, design, or construction at each NASA Center. Utility system replacement projects have reduced the risk of major utility failures that could impact Agency operations. NASA’s 2012 facility assessment noted that the Agency’s deferred maintenance, which is an estimate of the essential but unfunded maintenance work necessary to bring all facilities up to standards, decreased 5.7 percent from 2011 levels. The survey noted that demolition and replacement of major facilities are dominant factors contributing to this reduction in deferred maintenance. An assessment of NASA’s real property inventory indicates that the inventory has been reduced slightly. NASA estimates that it will reduce administrative space by 256,000 square feet by 2015 through demolition, transfer, and lease termination.

In summary, NASA’s master planning process reflects significant progress toward the responsible stewardship of the Agency’s physical infrastructure through forward-thinking, systemic strategic planning. As NASA works to implement its strategic infrastructure goals, the Agency will continue to construct and operate only those assets required to conduct its programs, maintain core capabilities, and meet national responsibilities. As such, NASA’s real property requirements are evaluated based upon the fulfillment of direct or anticipated program and mission requirements. At the same time, NASA seeks to fully leverage Agency-retained assets to increase their functionality in support of mission success. NASA will continue its effort, through existing processes and initiatives underway, to identify cross-Center consolidation opportunities that contribute to a reduction of duplicative or unneeded infrastructure and ultimately, to a more efficient use of taxpayer resources in the achievement of the Agency’s mission.

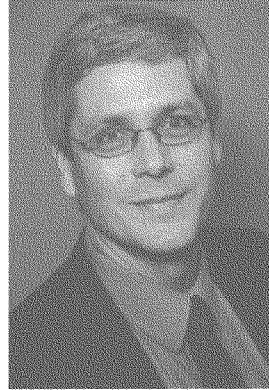
NASA is committed to implementing its facilities management plans and achieving strategic infrastructure goals through management, development, and operational strategies that reduce life cycle cost and risk while ensuring safety and mission success. However, like all Federal agencies, NASA is challenged with implementing these goals within a budgetary environment that can be difficult to predict. NASA is carefully prioritizing its efforts to sustain continued progress toward the most efficient and prudent stewardship of its physical infrastructure. We appreciate the continued support of the Space Subcommittee and Congress to ensure stable funding for NASA as it works to maintain, protect, and improve these important national space program assets.

Biography of Mr. Richard Keegan

Richard Keegan was appointed as NASA's Associate Administrator for Mission Support on August 11, 2013. The Mission Support Directorate enables program and institutional capabilities to conduct NASA's aeronautics and space activities. As the directorate's associate administrator, Keegan is responsible for most NASA management operations, including human capital management, Headquarters operations, agency operations, the NASA Shared Services Center, strategic infrastructure, cross-agency support and construction and environmental compliance and restoration.

Additionally, Keegan has been serving as NASA's Associate Deputy Administrator since December, 2010. The Associate Deputy Administrator assists and supports NASA's Deputy Administrator and Administrator during day-to-day Agency operations, across the broad scope of institutional and workforce issues, as well as with contingency and continuity of operations planning. Previously, Keegan served as Deputy Associate Administrator of the Mission Support Directorate since its creation in April, 2010. For the prior four years he was Director of NASA's Office of Program and Institutional Integration. In those roles, he served as the focal point for balancing priorities for mission directorates, mission support offices and field Centers for the Agency.

Since coming to NASA Headquarters in 2002, Keegan has served in senior business management positions in mission directorate and mission support offices. He also worked in a variety of jobs during 21 years at NASA's Goddard Space Flight Center in Greenbelt, Md., NASA Headquarters and the Department of Energy. He began his Federal service in June, 1980. Prior to that, he was a junior high school science teacher for two years. He has degrees in biological sciences and secondary education from the University of Maryland.



Chairman PALAZZO. Thank you, Mr. Keegan. I thank the witnesses for being available for questioning today. Reminding Members that Committee rules limit questioning to five minutes, the Chair will at this point open the round of questions. The Chair recognizes himself for five minutes.

My question is going to be for Mr. Martin or Mr. Keegan. Both of you can answer. How does NASA's Enhance Use Leasing authority differ from the authorities granted to other Federal agencies? Mr. Keegan, you would like to start?

Mr. KEEGAN. I am not certain the authorities other agencies have in the Enhanced Use Leasing area. I know that we use our Enhanced Use Leasing authority at five Centers currently, and I think there is more that NASA can do to take advantage of that authority. But I am not aware of a comparison with other agencies and the particular authorities they have under Enhanced Use Leasing. I know we are restricted, for example, from the nature of in-kind contributions we can accept and things like that.

Chairman PALAZZO. That is a good question. Mr. Martin, do you—I will come back with the in-kind limitations.

Mr. Martin, do you have—would you like to add anything? Because I know there have been reports and studies, you know, talking about NASA's Enhanced Use Leasing authority compared to other agencies. I am assuming you all read these and can kind of glean best practices.

Mr. MARTIN. Yes, I was going to comment on the same thing Rick mentioned that is the limitation on Enhanced Use Leasing. The in-kind contributions need to be tied to some type of—

Mr. KEEGAN. Energy.

Mr. MARTIN. —energy-dependent type thing, and I think as we talk about what are possible changes that Congress may consider, it may be removing that limitation.

Chairman PALAZZO. Would you like to expand on that to maybe address possibly commercial space endeavors and others, because it is limited to just energy—environmental projects at this time.

Mr. KEEGAN. I know that NASA requested authority this year to accept commercial revenue under tightly controlled circumstances where we share, for example, a launch complex. I know the Air Force has—or DoD has that authority where they can accept a commercial vendor's funding to fund a support contract at that launch facility to provide services to all the launch vehicles, government and commercial, and giving NASA that authority would give us—it might provide some leveraging of resources, but also from a private industry point of view, create common business practices, whether it is a NASA launch site or DoD launch site.

Chairman PALAZZO. If we expand these authorities, would you all like to—I mean, how would we go about A) making sure it is uniform and fair across all the Centers, and B) how are we going to protect the taxpayer investment and making sure that we are getting the right return on these agreements and authorities? Mr. Keegan?

Mr. KEEGAN. I think, first of all, any degree of oversight, you know, the Committee would want to exercise would be important, but NASA would develop internal procedures for the use of those authorities that would make sure that we make decisions that are

optimum from an agency level that are equitable across the Centers, and that do protect the taxpayer interest to get the, you know, the most and maximum benefit out of the assets that they have funded, you know, at NASA.

Mr. MARTIN. Mr. Chairman, if I could just add to that?

Chairman PALAZZO. Yes, Mr. Martin.

Mr. MARTIN. The broader issue on leasing is that leasing is a valuable mechanism that NASA can use to help pick up some of its operations and maintenance costs. We did a review looking at NASA's leasing practices, and our bottom line conclusion there—quite frankly, there were several. One is that NASA—before you can enter into an Enhanced Use Lease or a traditional lease, NASA needs to make a decision that it needs to retain that facility or property for a future mission use. We found that NASA wasn't making that decision as a threshold matter. You are not supposed to use leasing of in kind as a substitute for disposal, demolition, or giving over it to GSA. So that is a threshold issue. The threshold decision is does NASA have a future mission use for this facility or property? And if so, our audit found that NASA was not aggressively promoting these leasing opportunities at its Centers.

Chairman PALAZZO. I mean, that comes back to we really need a roadmap for where NASA is going to explore next so we can actually determine what facilities and infrastructure that we truly need. Would you agree with that, Mr. Keegan?

Mr. KEEGAN. Yes, I think a definitive roadmap obviously would allow us to focus our facility investments, sort of have more certainty about where we are going and the kind of investments we need to make.

Chairman PALAZZO. Mr. Martin?

Mr. MARTIN. I would agree as well. We pointed out in our written and oral remarks that changing the focus of these sort of big ticket, long-term missions, and focused primarily on human exploration, is costing the taxpayers a significant amount of money.

Chairman PALAZZO. I have a tendency to agree, and I think that is one of the reasons why the NASA 2013 Authorization Act does direct NASA to come up with a roadmap so that we can know where we are going, and then we can all focus on getting there.

So I appreciate your questions. My time is expired. I now recognize Ms. Brownley for five minutes.

Ms. BROWNLEY. Thank you, Mr. Chair, and my question is directed to Mr. Martin.

Your office's February 2013 report on NASA's environmental remediation efforts at the Santa Susana Field Laboratory appears to question NASA's 2010 agreement with the State of California to clean up NASA's portion of the site to background levels. It says, and I quote, "NASA has agreed to clean its portion of the Santa Susana site to a level that exceeds the generally accepted standard necessary to protect human health in light of the expected future use of the site." In your report, are you suggesting that NASA not comply with the agreement, and if so, could you clarify its findings and recommendations?

Mr. MARTIN. Sure. Our recommendation is just as you spelled it out. The Santa Susana Field Laboratory, we believe that NASA needs to investigate any and all alternatives for reaching a more,

we think, appropriate resolution of the environmental remediation based on the future use of the site. The agreement that NASA has entered into, as you indicated, would be to clean the Santa Susana Field Laboratory, NASA's portion, to a background level, which will cost taxpayers over \$200 million. Given that the expected future use is for recreational purposes, cleaning up to that level will cost the taxpayers \$25 million. And so we were laying the facts out there that NASA should do everything in its power to clean—to follow, I think, what is the normal practice and clean this site for its expected future use.

Ms. BROWNLEY. Okay. Well, I think the future use I think is still—I don't think it is defined necessarily to strictly recreational areas, but I know that there is some interest in moving in that direction. But the agreement certainly was very carefully negotiated, certainly by the State of California and DTSC, and there was a reason I think the State felt and I certainly concurred that cleaning up to background levels was the appropriate clean up for it to be safe for potentially recreational use or other uses. But I appreciate your comment on that.

I guess I would follow up with Mr. Keegan with regards, again, to the Santa Susana Field Lab and its clean up. So I understand, certainly my interpretation and I think the State of California's interpretation on the AOC is that the agreement is it will get cleaned up to these background levels. I know that there was recently a completed EIS report, and the purpose of that EIS report was to determine the best ways in which this clean up could occur. I think we are in the process of a public comment period as we speak, which ends, I think, on October the 1st.

So I was just wondering with the EIS report and that process that is going on if you could just comment from your vantage point what is the status of NASA's actions with respect to the clean up of your portion of that site?

Mr. KEEGAN. Yes, Congresswoman. All the information you just related is my understanding as well of where we are. The draft EIS is open for comment until October 1, and we expect a final EIS in November, and NASA is committed to fulfilling our obligations under the AOC. There is sufficient funding in our FY14 request to accomplish all the activities that are planned for FY14, leading to fulfilling our commitments under the AOC.

Ms. BROWNLEY. So regardless then of what the IG may be recommending, your commitment is still to the agreement with the AOC?

Mr. KEEGAN. We are committed to the agreement under the AOC.

Ms. BROWNLEY. Okay, thank you.

Thank you very much, and I will yield back my time.

Chairman PALAZZO. Thank you. I know recognize Mr. Brooks for five minutes.

Mr. BROOKS. Thank you, Mr. Chairman.

Which one of you two would be best to share information about launch pad 39A? Do you both have insight on it?

Mr. MARTIN. The Inspector General's office has not done any audits or reviews of the current—certainly the current RFP that is on the street for leasing. We have looked more broadly at launch infrastructure, but we have not looked specifically at pad 39A or 39B.

Mr. BROOKS. Mr. Keegan?

Mr. KEEGAN. I can talk in general terms about pad 39A as an asset, but not about the ongoing competition, because it is a matter that is under competition and we want to preserve the integrity of that competition.

Mr. BROOKS. Are you familiar with the accumulated taxpayer costs for the construction and maintenance of launch pad 39A?

Mr. KEEGAN. The current replacement value if we were to build a new one just like that is over half a billion dollars. It is \$535 million.

Mr. BROOKS. Five hundred thirty-five million dollars. Are you familiar with the annual maintenance costs for launch pad 39A?

Mr. KEEGAN. When it was in operations, it was about \$12 million a year. Now in the mothball status when we are doing only a minimal amount of maintenance, it is \$1.2 million.

Mr. BROOKS. Well, I do want to address as best as possible the announcement for proposals or request for proposals concerning 39A. It has come to my attention that it is possible that under the current proposal situation that 39A could be taken over by one private company. Is that an accurate perception that I have?

Mr. KEEGAN. The AFP, which is a public document, is open to proposals for either single user use or multi-user use of pad 39A. We don't express a preference for the operational concept.

Mr. BROOKS. Are you familiar with SpaceX's proposal?

Mr. KEEGAN. I probably should not comment on that.

Mr. BROOKS. Are you familiar with it? That is my first question, not whether you should comment on it.

Mr. KEEGAN. Yes.

Mr. BROOKS. And is it public?

Mr. KEEGAN. No.

Mr. BROOKS. The information I have from the Committee staff and also from letters by my colleagues in the House and then also individuals in the Senate to NASA, they express concern that the way things are going, NASA may turn over launch pad 39A to a single user, SpaceX, which would be to the exclusion of other commercial space providers and also potentially to the exclusion of launch pad 39A being a backup for the Space Launch System. Is there any merit to those concerns expressed by my colleagues in the House and their letters to NASA, and then also by Members of the United States Senate?

Mr. KEEGAN. I would—as I said earlier, the AFP that NASA issued indicated that we were open to either a single user concept or a multi-user concept. With respect to SLS, I think our analysis indicated that pad 39B is more than sufficient under any reasonable scenario to fully subscribe—to fully meet the requirements of SLS. As a matter of fact, it won't fully subscribe 39B. 39B has the potential to do a lot more, and so to achieve that maximum potential, we are looking to make 39B a multi-user launch pad.

Mr. BROOKS. Well, I have serious concerns and reservations with NASA's potential plans to lease Kennedy Space Flight Center's launch complex 39A exclusively to one company. If you would, please explain to me and the panel what benefit it is to taxpayers for one commercial provider to have sole use of pad 39A, regardless of which commercial provider that may be.

Mr. KEEGAN. I am not sure how much I should say about this. I would just say that the AFP provides the criteria under which NASA will make a selection in best interest of the public to get the maximum benefit for the public out of that asset that taxpayers have invested in.

Mr. BROOKS. Well that being the case, as much as I can, I would encourage NASA to make launch pad 39A a multi-user facility. I have reservations about the potential adverse impact on our space program of one of our primary launch pads being taken over by one user, which in my judgment, would tend to both stifle competition, which I think is a good thing, on the one hand, and on the other hand, reduce the ability of 39A to be used as a backup, should it be necessary for either other private users or by NASA itself.

I see my time has expired, but I hope that you will take my concerns and the concerns of other Members of Congress and of the United States Senate into account as NASA wrestles with this matter. Thank you.

Chairman PALAZZO. I now recognize Mr. Kilmer.

Mr. KILMER. Thank you, Mr. Chairman. I want to follow up on the previous gentleman's line of questioning.

A handful of questions. If launch complex 39A is run as a multi-use facility, I understand the commercial companies involved want to make it multi-user. Has NASA completed fully converting launch complex 39B into a multi-user facility, and if not, what is the remaining cost of doing so? And if so, can we assume that no more taxpayer funds are needed to modify 39B for multiple users?

Mr. KEEGAN. The work to convert pad 39B is not fully complete, but I don't have the cost figures. We are in that scheduled process. If you like, I could provide that for the record.

Mr. KILMER. Thank you. In addition, can you talk about how those costs compare to the \$1.2 million of maintenance costs that you just spoke about related to pad 39A?

Mr. KEEGAN. The cost for conversion of 39B or ultimately for the cost of maintenance?

Mr. KILMER. Both.

Mr. KEEGAN. I don't have the specifics on that, but again, I can provide that for the record. I am certain that an active launch pad would cost more to operate and maintain than the \$1.2 million to maintain a mothball launch pad.

Mr. KILMER. Okay. Thank you. The rest of my questions were covered. Thank you.

Chairman PALAZZO. The gentleman yields back. I now recognize Mr. Stockman for five minutes.

Mr. STOCKMAN. Thank you. I remember when the Columbia had its unfortunate accident, and the one thing that they mentioned in the after report was the inability for NASA to focus on safety, and the culture—as you recall, the culture of safety was not there. And yet, I have this report in front of me, an internal review, which talks about safety. Some of the concerns I have are in regards to arc jet. Mr. Martin, are you familiar with the closing of arc jet?

Mr. MARTIN. I am familiar with the consolidation of the arc jet.

Mr. STOCKMAN. Are you familiar also with the report that I hold in my hand? It is called "The Inability to Certify TPS Performance." It was issued March 8, 2012.

Mr. MARTIN. I have not personally read it.

Mr. STOCKMAN. Okay. Mr. Chairman, I ask that this report be submitted for the record, and that one of the things—

Chairman PALAZZO. Without objection.

[The information appears in Appendix II]

Mr. STOCKMAN. One of the things it states, actually, your report is that this closing of arc jet could raise—and this is all quote from your own report—from NASA's own report. "We believe the loss will impact our ability to certify TPS or in tests next year." And I am wondering if you could take an opportunity to look at this. I mean, you and I or both of you could look at this and understand, I think, the mistake that is going forward on consolidating the arc jets, because quite frankly, it is going to impact safety. That is not me, that is—also, we have two letters from other individuals which I would like to also submit for the record—

Chairman PALAZZO. Without objection.

[The information appears in Appendix II]

Mr. STOCKMAN. Thank you, Mr. Chairman. I am wondering, if you haven't heard of this, why not and would you consider looking at this if we turned it over to you?

Mr. MARTIN. If I could, as a point of clarification, I am with the Inspector General's office. That is not our report. That is probably Mr. Keegan's report or big NASA's report or an advisory group. So I am not familiar with it because the Office of Inspector General has not issued that report. I would be happy to read any piece of paper that anyone puts in front of me—

Mr. STOCKMAN. Okay.

Mr. MARTIN. —to inform our independent review of NASA.

Mr. STOCKMAN. But I am just saying is the person that is—and we all remember the tragedy, and I just think that wisdom dictates that we take a look at what they are recommending and what is going on. And what is going on now is that we are transferring arc jet, and in the meantime, diminishing NASA's ability to create a culture of safety. I would think that you would be interested as Inspector General—that this would be something that would be critical to your office.

Mr. MARTIN. The culture of safety is critical to my office. Absolutely. Consolidating NASA's infrastructure is also critical.

Mr. STOCKMAN. But you wouldn't want to do it at the expense of safety, would you?

Mr. MARTIN. Not if there is a tradeoff. Safety would come first.

Mr. STOCKMAN. Okay. Well, I want to point to you that this is what is happening. In order to cut literally \$5 million out of a very large budget, it is questioning the rationale behind that and I am just really concerned that we are going to repeat our mistakes.

I guess, Mr. Keegan, you have something to say or do you want to comment on it? Are you more familiar with it?

Mr. KEEGAN. I am not familiar with any official NASA report that comes to that conclusion. I know our chief engineer and a whole team of engineers across the Agency looked at this closely and determined that we could safely make this transition. So—

Mr. STOCKMAN. Well, that is not what your own report says, or the experts. I am just letting you know. I will give it to you. I will give you the letters, I will give you your own report which I highly

recommend you read. I think that if this comes out down the road that we have problems then it is going to be looked back that we didn't do our jobs, that we on the Committee turned a blind eye to NASA documents and said we are going to go forward with a policy that is going to be detrimental to safety. And I just have to tell you, for me, that raises real concerns and I am glad you are open to reading this. I will forward you the documents and I hope you take into consideration.

My time is also run out, but if you guys could come by my office sometime and you want to speak with me, I would be happy to do so, but this is a fear that we are going to repeat the same mistakes we did before by making safety secondary to \$5 million. It just doesn't make sense.

Mr. Chairman, I yield back the balance of my time. Thank you.

Chairman PALAZZO. The gentleman yields back. I now recognize Mr. Bera.

Mr. BERA. Thank you, Mr. Chairman. I will just register support for the comments that Mr. Brooks and Mr. Kilmer made with regard to some concern about the launch complex 39A decision-making process, and I would register that I actually think it would be in our interest to have that as a multi-user facility.

My line of questioning is actually going to be a little bit different. Based off of Mr. Martin's opening testimony and based off of my vast congressional experience of 9 months on this committee, it seems as though we have gone through several missions just in that nine months. You know, when I first got here, it seemed like the mission was we were going to look for manned space travel to Mars, and we talked about asteroid retrieval. Then there was a shift to a mission to the Moon. I think you were very clear in your testimony that the first step we have to do is actually come up with a strategic plan, that we actually have to have a mission and a roadmap, and I think this committee has made that recommendation. Because if you don't have that long-term plan, if you don't have that roadmap, how are we going to make the decisions on what facilities to keep, what facilities not to keep, what to decommission, what the best process is? I would love to hear your thoughts on that, either one of you. But again, I think that is the critical issue here, how you get NASA, the Administration, and Congress on the same page to come up with a single mission in a single timeframe, and then we can make decisions. You know, if we want to go to Mars, is the best step to go to the Moon? Is the best step to do asteroid retrieval? So we need that clarity of mission, would you guys agree?

Mr. KEEGAN. Yes, Congressman, I would certainly agree that the more definitive your technical roadmap for your mission requirements, the more you can tailor and optimize the limited resources you have to invest, especially in these large cost items that Mr. Martin mentioned. So that would help.

I would say also that NASA agrees that we can also do better just in the situation we are in as pointed out in the Inspector General's report to do a better job within our existing authorities and our existing situation to dispose of our excess infrastructure as well.

Mr. BERA. Mr. Martin, would you agree with that?

Mr. MARTIN. Well, as the Office of Inspector General, we are not permitted to have any original thoughts or opinions. We are not management, we just come behind management after they have made a decision and criticize that decision.

Mr. BERA. So let me change the question. Would you agree lack of mission clarity makes it much harder to make some of these decisions on what assets to keep and what assets not to keep?

Mr. MARTIN. Absolutely.

Mr. BERA. Okay.

Mr. MARTIN. Absolutely, and then if I could, beyond the human exploration, you know, the scientific mission, which is obviously a massive component of what NASA does, the thermal vacuum chambers and a lot of the big ticket—the wind tunnels, the very expensive infrastructure that NASA has, you need to have a map.

Mr. BERA. Right. So my challenge to this body, my challenge to the Administration, my challenge to NASA's leadership is that we need to lock ourselves in a room, we need to agree on a mission, and we need to agree on a timeframe by which we hope to accomplish that mission, similar to President Kennedy giving us a challenge in the 1960s, to get this clarity, because how can you make decisions, how can you look at assets without knowing where we want to head? So that is not a question, that is just a rhetorical comment.

The other thing, Mr. Martin, in your testimony was the decision-making process. NASA as a large organization has to make central decisions. Each facility can't make their own decision—because they are based on the interest of that particular facility. Again, we are in times of tight budgets and we have to have a better decision-making process. So again, that is not a question, it is just a comment. The decision-making process is going to get more complicated as well because, you know, we are seeing this shift from a largely public government agency to one that is becoming a public-private partnership, and that adds just another dimension of complexity. So again, not a question but just an observation.

I will make one final comment. Again, I hope this body, this committee, the Administration, and NASA's leadership can come to an agreement on what our mission is, what our timeframe is, and then just agree and let's start moving forward and let's go forth and accomplish that mission.

Mr. Chairman, I will yield back.

Chairman PALAZZO. The gentleman yields back. I now recognize Mr. Hall for five minutes.

Mr. HALL. Thank you, Mr. Chairman. I am pleased to be here, and I am pleased at a guy named Olin "Tiger" Teague, whose portrait is right over here, he is watching and I hope he is listening to all of this, because I am a very pro-NASA guy, always have been since I have been here. I asked, through him, to get on the NASA Committee and Energy and Commerce, and received both of them back in 1981. I have been with this Committee ever since. I have seen some things I have disagreed with, but I think they always try to be fair, and I guess that is what we are asking for here.

I presume that NASA has a statutory mission obligating it to "seek and encourage to the maximum extent possible the fullest

commercial use of space.” That is a very good statement. You can comment on that, can’t you, sir?

Mr. KEEGAN. Yes, that is a very good statement.

Mr. HALL. You subscribe to that, don’t you, when you comment——

Mr. KEEGAN. I subscribe to that.

Mr. HALL. And with that mission in mind, I have some questions about the process NASA is using to determine the disposition of launch complex 39A and 39B at Kennedy Space Center. These are national assets that cost millions of dollars as has been testified to here to construct that are historic sites of numerous space launches. And I don’t have a Texas angle here. Johnson Space Center and Mr. Tiger are not involved here directly, but these launch pads certainly have an interest to all Americans in how they are going to be utilized to the greatest extent possible in the future, and how they will be maintained in the Florida environment. So it is my understanding that NASA is considering launch pad 39B for its own use in the future and is considering awarding the use of pad 39A for commercial industry use. Do you understand that and agree to that? You both agree to it? You think that is a good way to do it?

Mr. KEEGAN. I would put it somewhat differently. With the end of the Shuttle Program, NASA and Kennedy in particular identified assets that we would no longer require to implement our program, and in January, 2011 put out an announcement of availability to provide broad information about those assets. Pad 39A was one of those assets, the Shuttle launch facility was another one, Orbiter Processing Facility 3 was yet another, so——

Mr. HALL. Okay, I thank you for that, and I will get to that.

In regards to launch pad 39A, is NASA doing all it can to, as I have quoted up here, “encourage to the maximum extent possible the fullest commercial use of space.”

Mr. KEEGAN. Yes, that is a criteria in the AFP and we will evaluate the proposals according to criteria in the AFP.

Mr. HALL. Some have argued that NASA should operate 39A as a multi-user facility, given the significant investment by the taxpayers, roughly \$500 million. Please explain the rationale if 39A were not to be operated as a multi-user facility.

Mr. KEEGAN. The rationale would be that the proposed use in that scenario would best meet the criteria that we laid out in the RPF and provide the best benefit for the Nation of the investment in that facility.

Mr. HALL. What steps can NASA take to ensure that out-leases are awarded through an open, competitive, and fair process? Mr. Martin, will you respond to that?

Mr. MARTIN. Well, I think they have. They have the RFP, the request for proposals right now, and you have a decision-making process at NASA Headquarters which NASA currently is involved in. Again, as an Office of Inspector General, if there are any complaints or allegations that the process was somehow circumvented——

Mr. HALL. I understand your——

Mr. MARTIN. —we will jump in.

Mr. HALL. —thrust there. Who will make the decision for 39A, personnel at Kennedy Space Center or NASA Headquarters?

Mr. KEEGAN. That decision will be made at NASA Headquarters and I will be the source selection.

Mr. HALL. One more question about the closure of Johnson Space Center, and it is not—we don't—Johnson is not in this battle. But the NASA authorization of 2010, Sections 1102 and 1103 required NASA to conduct an institutional requirement study which has driven NASA's action to consolidate, retire, outsource, and revitalize various facilities. However, the language in Section 1105 states "Prior to receipt by the Congress of the study, recommendations, and implementations strategy developed pursuant to Section 1103, none of the funds authorized under this Act may be used to transfer the functions, missions, or activities and associates civil service and contractor positions from any NASA facility without authorization by the Congress to implement the proposed strategy." To your knowledge, has NASA complied with the law, Mr. Inspector General?

Mr. MARTIN. I am actually unfamiliar with that particular portion. I have not heard that they haven't complied with the law.

Mr. HALL. Congressional Members have asked multiple times through letters, and I understand that the delegation from Florida has stated their position and I respect that. I would do the same thing if I was on their—operated out of Florida instead of Texas. I just think that fairness is fairness, and ask this last question. Is Ames arc jet facility able to fulfill all of NASA's needs, Mr. NASA?

Mr. KEEGAN. It will be when we complete the transition.

Mr. HALL. Mr. Chairman, I thank the witnesses and I thank you. I yield back.

Chairman PALAZZO. I now—the Chair now recognizes Ms. Bonamici for five minutes.

Ms. BONAMICI. Thank you very much, Mr. Chairman. Thank you to the witnesses.

One of the things that we have talked about a lot in this subcommittee is the importance of and need to maintain United States leadership in space and aeronautics going forward, so I wanted to talk a little bit about the National Academy's assessment of the NASA laboratories.

In that assessment, the panel, after assessing the NASA laboratories use for basic research, recommended that NASA increase resources to its aeronautics laboratories and facilities to attract and retain the best and brightest researchers, and to at least remain on par with international aeronautical research organizations in Europe and Asia. So it is worth noting, too, that the panel found that the equipment and facilities at NASA's basic laboratories are inferior to those at comparable Department of Energy laboratories, top tier U.S. universities, and corporate research laboratories. You know, it goes without saying that without the modern and capable facilities, it is hard to remain competitive with the rest of the world.

So Mr. Keegan, in your prepared statement, the following reference to the National Research Council about the NASA laboratories, you state that "NASA is evaluating the replacement of several laboratories that will support the Agency's future research

needs.” So can you please talk a little bit about that effort and how you are weighing the importance of remaining competitive in the research field? How are you bringing in stakeholders on that task and how are you making research a priority?

Mr. KEEGAN. I would say that NASA is very concerned about the issue of having state-of-the-art research facilities and being able to attract the best and the brightest to work at NASA. In the NRC report, they cited the Exploration Sciences Building at Goddard as an example of a renewal facility or repair by replacement facility that included state-of-the-art laboratory facilities, and we have several similar facilities in planning or in design right now where we would replace old, antiquated facilities with a new, energy efficient, smaller footprint building but at the same time, including state-of-the-art laboratory facilities.

Ms. BONAMICI. And what is the basis of the definition? I understand it is future research needs. Where is that decision coming from, and who has input into that?

Mr. KEEGAN. The broader research community has input to it through the various standing mechanisms, but the—basically it is a decision that is made at the strategic level at NASA Headquarters in terms of where to put our priorities in terms of the research we should emphasize.

Ms. BONAMICI. Well, I want to align myself with Mr. Bera’s comments, too, about the need to have a clear mission, and again, that is critical to the work that you are doing but all of NASA as well.

Can you talk a little bit about the—what is apparently a \$2 billion deferred maintenance backlog. Is that getting worse, better, or staying about the same and what do you need to significantly reduce that deferred maintenance backlog?

Mr. KEEGAN. The deferred maintenance backlog is a measure of all the maintenance that it would take to bring all of our facilities up to current standards. It has accumulated and grown over the years, historically because NASA has not been able to carve out sufficient funding to maintain facilities up to standard from limited resources. Since 2011, it has come down and the way we were able to make progress against that was through the use of demolition—if you demolish a facility with a lot of accumulated deferred maintenance that comes off the books—and by our repair by replacement approach, where we replace old, antiquated facilities with newer, more efficient, flexible facilities, and again, we get rid of that accumulated backlog of deferred maintenance. So we have had a little success in the last couple years through using those strategies.

Ms. BONAMICI. Thank you, and can you follow up a little bit on the similar capabilities, smaller footprint strategy, and talk about why NASA settled on this strategy versus other options, and how is it going? And I want to ask Mr. Martin, too, based on your work, to what extent is NASA positioned to make progress on carrying out the similar capabilities, smaller footprints, and what might be the barriers?

Mr. KEEGAN. We chose that because we thought we didn’t want to reduce the capability that NASA had, but we thought it had to exist in a smaller footprint because the resources weren’t available to maintain sort of the capability suite that we have.

Mr. MARTIN. I think the jury is still out about how successful. We are seeing some of the dynamics during this hearing here, some of the cultural and historic influences within NASA about shedding itself from a Center and program-specific area. We are seeing some of the, as GAO calls it, stakeholder influences, the political influences that individual Members of Congress don't want to diminish the capabilities of NASA Centers within their jurisdictions. It is very complex and dynamic. I think it is too early to tell specifically though how this is going to play out.

Ms. BONAMICI. Thank you, and my time is expired. Thank you, Mr. Chairman.

Chairman PALAZZO. Mr.—the Chair now recognizes Mr. Posey for five minutes.

Mr. POSEY. Thank you very much, Mr. Chairman. I am sure we have all been witness to the fact it often seems that everyone in the room knows how to make a baby stop crying, except the person who is holding it. In the interest of balance, I would like to enter into the record and briefly quote a couple of the letters referred to a few minutes ago by the gentleman from Texas, Mr. Hall.

Chairman PALAZZO. Mr. Posey, I am going to reserve the right to object to the inclusion of this material into the record until my staff and I have the time and opportunity to review it.

Mr. POSEY. Mr. Chairman, with all due respect I will yield to that. I haven't ever heard of that rule before.

Chairman PALAZZO. Neither have I, until the last minute so why don't we do this? Since I have already done it twice, we will do it a third time. Without objection.

[The information appears in Appendix II]

Mr. POSEY. Thank you. I would just like to read a couple of lines of it. We won't enter it into the record until you have had a chance to prove it.

But it says "We write to voice our continued support of NASA's ongoing effort to quickly and efficiently lease their costly, excessive space launch infrastructure and other assets for commercial use consistent with—" and it gives all the Federal regulations. "Two decades ago, the United States was a world leader in commercial launches. Today, that has virtually disappeared. However, there are American launch companies that are committed to changing that." And we basically talk in this letter, then, about the rest of the world, China, Russia, et al, are launching commercial satellites left and right while our best launch pads sit there and rot. We commend NASA for moving forward, essentially, and I think you will be pleased to include the letter when you have the opportunity to read it, or your staff does.

You know, Kennedy Space Center and NASA is asking for proposals for both single and multi-user pad use. People here are trying to weigh in, actually, before that process is completed. Our position is we need to complete the process. We are not taking sides on the formal configuration of the launch pad, whether single or multi-use, although they are looking at both. We just want our space program to move forward. We want to alleviate the Monday morning quarterbacking and second guessing. We have Inspector Generals that do that for us. You know, we have used charts and

we have seen charts in this Committee that are a matter of record that show over two dozen of our space programs—we call them missions to nowhere—over the last two decades, and billions and billions and billions of dollars wasted because we have the parochial interest of different members trying to micromanage what NASA does. It is like a city councilman trying to tell police chief who to arrest and who not to arrest. I think that is a big problem and that is the essence for this letter.

A question I have for the Inspectors—and I have several. I hope we have time for a second round today. Earlier this summer, the Kennedy Space Center selected Space Florida to operate their former Shuttle landing facility. It is well-known that the Federal Government can prove difficult for private industry to partner with, obviously, because the government has many bureaucratic policies and procedures. Can you tell me what steps NASA is taking to ensure Space Florida's success in attracting commercial business to the KSC former Shuttle landing facility?

Mr. KEEGAN. My knowledge of that process is that we are anticipating negotiations with Space Florida beginning soon and anticipate a lease award in December. I am unaware of any issues in that regard.

Mr. POSEY. Okay, thank you.

NASA has determined that much of its former Shuttle infrastructure at Kennedy Space Center, including 39A, is no longer needed by the space agency. If NASA is unable to attract private companies to utilize these facilities, what will happen to them, just for the record?

Mr. KEEGAN. They will be excessed and demolished or abandoned.

Mr. POSEY. At a loss of a significant investment.

Mr. KEEGAN. That capability will no longer be there.

Mr. POSEY. Thank you. Do you believe that NASA has the legal authority it needs to expeditiously deal with their excess or underutilized property?

Mr. KEEGAN. I think yes, we have the authority to effectively deal with that, yes.

Mr. POSEY. Okay, my time is up. Thank you, Mr. Chairman. I yield back.

Chairman PALAZZO. Mr. Posey, are you done? Okay. I just want to remind you also that your letter has been entered into the record without objection. I do just want to remind all the Members it is normal practice to allow staff to review your letters for the record or reports for the record, so if we could, we will try to do that in the future.

Mr. POSEY. One question, Mr. Chairman.

Chairman PALAZZO. Yes.

Mr. POSEY. There were two letters. There was a bipartisan letter signed by every Democrat and every Republican member of the delegation in the House, and there was one signed bipartisan, both our Democratic and our Republican Senator signed a similar letter. Are both of those bipartisan unanimous letters admitted for the record?

Chairman PALAZZO. They will be without objection.

Mr. POSEY. Thank you, and I apologize if you had not had the chance to see these letters before. I thought we had supplied you copies of them. Mr. Hall had copies of them and some of the other Members did, and I do apologize if you did not get them.

Chairman PALAZZO. Thank you. The Chair now recognizes Mr. Veasey. Okay, he is good. The gentleman yields back. The Chair now recognizes Mr. Rohrabacher.

Mr. ROHRABACHER. Thank you very much. I wasn't expecting that.

Just one note, I have been here 25 years and people ask me, what is the thing that you are the proudest of that you have accomplished in Congress? Now with Ralph, he has been here a lot longer and had a lot more accomplishments than I have, so it doesn't take me a long time to figure out what it is that I am the most proud of. And one of the things I am most proud is that I am the author of this Commercial Space Act of 2004. I think that bill, that piece of legislation has done more to change America for the better than anything that I have done in 25 years. Now my Democratic colleagues wouldn't be surprised that that is the only thing that I am lauding right now, but the fact is is that we all worked together and this is the great thing about this Committee is that we do work together as Democrats and Republicans and try to get things done because we believe in space, but we also believe in science and technology as an energy source for our country to improve its condition and the condition of our people.

If America is to remain the leading Nation or at least a leading Nation in space, we must ensure that the energy and the creativity of the American commercial space industry is brought into the play in a big way. To the degree that we have not laid the foundation so that the creative genius and investment by people in the private sector can take place, well, we will be limiting America's role and America's leadership in space. So that is one of the things that we are talking about, facilities. It is really important that we use our facilities in a way that is maximized, that are going to maximize bringing in private sector involvement and investment, especially if we are talking about assets that are now not being used and are not likely to be used by NASA. We have some—let me just note, I know that there is a controversy about this space pad '39A, and I will just say this. We need—right now, we need to make sure that whatever decision is made, it is going to make sure that that asset is put to use for—as soon as possible for as long as possible in producing a service or producing an activity that will benefit our people. We have got people in the private sector who want to use that. If it is determined that one decision will mean that that pad is not being used, well, we shouldn't make that decision. There is a decision that says well, it is going to be used right away and it is going to be put to use as soon as possible, well that is a decision that we should be doing. We shouldn't be—and that is just my advice. That was the spirit behind that bill, the Commercial Space Act. Let's get as many people involved and invested in space and space activities as we can and as soon as we can. So that is my bit of advice on how to solve that problem. I am not being specific because I don't have the wisdom to go through all of the, you know, paperwork to make that determination. But I would say it should

be based on that concept and also it should be based not on the philosophy, but on what practically will have that impact.

I think I am going to leave it at that. I would yield my friend, Mr. Stockman, 60 seconds.

Mr. STOCKMAN. Thank you. Mr. Chairman, as a follow up to my questions to Mr. Richard Keegan on the safety concerns of the internal NASA report, I cited I would ask that part of my questions for the record for the NASA Chief of Safety and Missions Assurance address the concerns and response to the Committee. I understand that safety is not necessarily Mr. Keegan's job, but is in NASA's witness before us today, so I ask that that follow up occur, Mr. Chairman. Thank you.

Mr. KEEGAN. And I would say that our Administrator has told us safety is every one of our jobs, so—

Mr. STOCKMAN. So you can go on the record that you will show this to the head of the safety?

Mr. KEEGAN. Yes.

Mr. STOCKMAN. Okay, thank you.

Mr. ROHRABACHER. And my time is up. Thank you, Mr. Chairman.

Chairman PALAZZO. Well thank you. At this time, we will—we do have a little time before votes are going to be called. They estimate it is going to be at 10:50. There are—I believe some members have said they would like to ask a few more questions, so if you don't mind, we will go into a second round.

At this time, we will go into a second round of questions. Just real quick, Mr. Keegan. How does NASA decide if a facility is underutilized? In some of the follow up aspects of your answer, include the standard criteria that would be used. What is the process for making such a determination, and of course, what type of oversight provisions exist to ensure that this process is not manipulated or taken advantage of?

Mr. KEEGAN. It is, first of all, an open agency discussion with all of the relevant stakeholders taking place. But utilization is measured based on a facility's capacity versus the actual activity that takes place in that facility during a period of time. So if a test stand is available but is only used, you know, 50 percent of the time that it is available for testing, you would just say that is underutilized. That doesn't necessarily mean that it is excess. If that facility has a unique capability that is critical to NASA, we need to keep it and we would strive to increase the level of utilization to spread to fix costs, but it doesn't mean we can somehow excess it. So I think in general, that is responsive to your question.

Chairman PALAZZO. Mr. Martin, do you have anything to add?

Mr. MARTIN. Not too much to add, no, not to that. The criteria that the Agency uses to identify what is excess—I mean, there are test stands, as Mr. Keegan indicated, that may be used once a year, just given the current human exploration or rocket development program, and that is underutilized, but if you only need to use it once a year, you have to have that capacity when you need it.

Chairman PALAZZO. Good response. How about from an oversight controls standpoint?

Mr. MARTIN. Well I mean, what we have is—and we discussed it in our testimony—is you have redundancies, I think unnecessary redundancies among many of the Centers, because historically they have competed for work. I mean, there used to be a philosophy just a handful of years ago about sustaining ten healthy Centers, that is, partitioning the work at that time in the Constellation Program among all the Centers to keep them busy. Well, Constellation is no more and clearly from an infrastructure perspective NASA does not have, unfortunately, ten healthy Centers. I am not sure from an infrastructure standpoint NASA has a single healthy Center.

Chairman PALAZZO. Well, I appreciate that comment but I think it comes back to the stark reality is that we need a roadmap to exploration so these Centers can actually judge their infrastructure, judge their facilities and so going forward, they can actually know are they going to be utilizing those assets in the future, because you know, it was mentioned that people like to hold on to their facilities and hold on to their assets, because they don't know what is going to be there tomorrow because of the massive amount of uncertainty. And I think this Committee will agree with that because it has been mentioned several times.

So at this time, I will recognize Ms. Brownley.

Ms. BROWNLEY. Thank you, Mr. Chair.

I wanted to—Mr. Keegan, wanted to follow up with Ms. Bonamici's line of questioning around the deferred maintenance backlog and clearly, that is a backlog that this significant is going to impede construction and maintenance and operations budgets. So I wanted to follow up with the question that if budgets remain at the current level, how much progress do you think in the next five to ten years could NASA expect to make on its goal that was stated in the Agency Master Plan of having 62 percent of NASA's assets be under 40 years old by 2055?

Mr. KEEGAN. Clearly our ability to make progress against that strategic goal is limited by the resources that are available to accomplish it, so we would still be shooting at the same goal but it would take us that much longer to get there.

Ms. BROWNLEY. So I mean, if you had to kind of reconcile things based on the current level of budgeting, you couldn't predict what it might look like five to ten years out?

Mr. KEEGAN. Not certainly in the moment, and it would be very difficult anyway because we would have to, I think, go back and revisit the assumptions then about the amount of infrastructure we would have and can we do anything to affect that, and so forth.

Ms. BROWNLEY. Okay. And then following up on that, if current trends continue, I fear that NASA will reach a point of mediocrity and due to the condition, age, and capabilities of the facilities. In your opinion, how far away from that point do you think we are?

Mr. KEEGAN. In my opinion, I believe and I hope that we are a long way away and we have a dedicated group of employees and leaders trying to figure out innovative ways to address sort of these difficult issues and complex issues that would allow us to make better progress even in a resource-constrained environment.

Ms. BROWNLEY. Well, thank you. I mean, I think I certainly believe and I know the Ranking Member also believes the importance of investing in NASA and enabling the Agency to carry out a 21st

century space program. And on the other hand, I think that given where the budget is and so forth, it may be worthwhile for us to be looking or at least to know what a plan B might look like with budgets as they are and what it might look like so that we can, I think, better evaluate a future direction.

Mr. KEEGAN. Thank you.

Chairman PALAZZO. The Chair now recognizes Mr. Posey.

Mr. POSEY. Thank you, Mr. Chairman.

In your written testimony, you said that the Agency will continue to conduct and operate only those assets required to conduct its program, maintain core capabilities, and meet national responsibilities. And yet, NASA's own IG report earlier this year noted that the Agency has historically maintained unused facilities for a decade or more, and that it is an institutional problem. How do you see this culture being changed and NASA said their 10 research Centers will manage their infrastructure in a coordinated fashion?

Mr. KEEGAN. As the Inspector General also pointed out, it is a complex problem to address, and sometimes there are differences of opinion about whether a capability may be needed at some time in the future or not. As an example, some of the facilities mentioned in the Inspector General's report, some have been demolished, some have been abandoned or mothballed, but others are currently active again because requirements have emerged to use the capabilities in those facilities. And so there is some difficulty, and a lot of this is based on judgment and prediction of what might be required. I would say that with the—we created the Mission Support Council at the Agency level in order to provide some kind of Agency-wide strategy and optimization of these types of decisions. It is not just managed at the local level. And we have active teamwork with all the Center directors and relevant Agency managers to make sure we make decisions in the best interest of the Agency. But it is a problem that we have to wrestle with and make better progress against.

Mr. POSEY. Thank you. Buried deep in the appendices of the IG's report was a reference to a recent change we made which allowed DoD to work with contractors on property that they don't have a use for and which would be to the mutual benefit of the taxpayer. I was delighted to see that there and I would just like to encourage you to share with our staff the benefits of allowing NASA to do that. I think it would be much more effective and I think our taxpayers would be much better served, and it would probably make a whole lot of people a lot more comfortable, reduce a lot of bureaucracy, and every American would benefit.

What is—same question for each of you—the single best action that you believe that Congress could take to improve our space program?

Mr. KEEGAN. I think I would defer that to my Administrator.

Mr. MARTIN. I think my answer would be to come together on the broad overall mission for NASA, not just human exploration, but science, aeronautics, if it is even possible to come together, and then to fully fund that mission. Because for far too long, NASA has been asked to do too many things with not enough funds, and then we have hearings—important hearings like this, but discussions like this. So identify the missions, plural, fully fund those missions

over the long term, and I think that is the best thing that could happen.

Mr. POSEY. Well, I think that is the heartfelt wish of everybody on this Committee on both sides of the aisle. The only time it ever gets a little bit difficult, I think, is when we try and all agree on what exactly those missions are and we try and convince the other 430 Members that aren't in here of the necessity of fully funding it. The residual benefits that every American receives from our space program—but I appreciate your comments and if you get more developed through the flow chart, and I would appreciate you sharing those with us as well.

Thank you very much. I yield back, Mr. Chairman.

Chairman PALAZZO. The gentleman yields back.

I want to thank the witnesses for their valuable testimony and the Members for their questions. The Members of the Committee may have additional questions for you, and we will ask you to respond to those in writing. The record will remain open for two weeks for additional comments and written questions from Members. The witnesses are excused, and this hearing is adjourned.

[Whereupon, at 10:55 a.m., the Subcommittee was adjourned.]

Appendix I

ANSWERS TO POST-HEARING QUESTIONS

ANSWERS TO POST-HEARING QUESTIONS

Responses by The Honorable Paul K. Martin

Subcommittee on Space
Committee on Science, Space, and Technology
U.S. House of Representatives

Questions for the Record

“NASA Infrastructure: Enabling Discovery and Ensuring Capability”

Friday, September 20, 2013

9:30 a.m.

Room 2318 Rayburn House Office Building

Paul K. Martin, Inspector General
National Aeronautics and Space Administration

Questions Submitted by Rep. Steven Palazzo, Chairman

1. **You wrote in your testimony that NASA lacked guidance to ensure that property identified for leasing had a current or future mission use. Can you explain what type of guidance is needed?**

Answer: Our August 2012 audit report, “NASA’s Infrastructure and Facilities: An Assessment of the Agency’s Real Property Leasing Practices” found that NASA policy was unclear regarding the criteria Centers should use to evaluate whether to retain and lease or dispose of underutilized Agency property. Specifically, we found that NASA’s policy did not adequately explain how Centers should determine whether property has a current or future mission use. For example, the policy does not require Centers to seek formal input from Mission Directorates regarding their future real property needs. We recommended that NASA revise existing policy and develop new policy with respect to these issues. NASA is in the process of implementing our recommendations.

2. **You stated in your written testimony that while you viewed the Agency Master Plan and associated actions as a positive step, that NASA’s infrastructure reduction initiatives had seen limited success in the past, and that you were concerned that these latest efforts would fail as well.**
 - a. **What lessons can be derived from these failed infrastructure initiatives?**
 - b. **Your testimony stated that “absent strong and sustained leadership to see its current efforts through and incorporate them into Agency policy, we are concerned that these latest efforts will meet a similar fate.” Based on the failure of past Agency initiatives, what specific steps would you advise NASA officials to take as part of the “strong and sustained leadership” to see these efforts through?**

Answer: Our February 2013 audit report, “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities” discusses the challenges that historically have contributed to NASA’s limited success in reducing its infrastructure. These include: (1) fluctuating and uncertain strategic requirements, (2) Agency culture and business practices, (3) political pressure, and (4) inadequate funding.

Given these challenges, successfully “rightsizing” NASA’s real property footprint will require a sustained commitment from Agency leaders to see ongoing infrastructure-related initiatives through to completion. Specifically, NASA managers must ensure that current and future initiatives are institutionalized, coordinated, and communicated both inside and outside the Agency. They also must be willing to make difficult decisions to divest unneeded infrastructure, effectively communicate those decisions to stakeholders, and withstand the inevitable pressures from Federal, state, and local officials.

3. **With regard to the Agency Master Plan, a December 2011 OIG report recommended that NASA: provide clear guidance to Centers on the information needed in the Centers’ master plans; ensure that plans to reduce the Agency’s real property footprint more fully consider the specific mission of the individual Centers when setting reduction requirements; and update NASA policy to better reflect the current risk-based process for prioritizing institutional Construction of Facilities projects.**
 - a. **The February 2013 OIG report on facilities maintenance indicated that the Agency was still implementing these recommendations. What is the status of the Agency’s implementation of these recommendations 8 months later?**

Answer: NASA has completed action on two of the report’s three recommendations. Specifically, NASA has updated its guidance to ensure clear linkages between projects and Agency or Center goals in the Center Master Plans. The updated guidance requires Center Master Plans to reflect Agency strategies, Center and mission capabilities, and Center goals and objectives. The revised guidance also specifies the documentation required to be incorporated into the Center Master Plans and requires that Centers incorporate both institutional and programmatic funding in the plans. Requirements for reductions in footprint are now negotiated with each individual Center rather than having an across-the-board reduction target. For the third recommendation, NASA is revising policy to better reflect the current risk-based process for prioritizing facility construction projects and expects to issue the revised policy by March 31, 2014.

4. **In your February 2013 report on infrastructure, you recommended that NASA “Expedite implementation of Corporate Portfolio Management and ensure the process is updated, documented, and established into policy.” What is the current status of the implementation of this recommendation? Does it appear to have made a difference?**

Answer: In response to our audit report, the Associate Administrator for Mission Support stated that NASA plans to implement a Corporate Portfolio Management process and incorporate it into Agency policy by September 2014. We plan to evaluate these actions upon completion.

5. In your February 2013 report on infrastructure, you recommended that NASA implement changes to its Technical Capabilities Database to improve data accuracy, including developing a process to ensure multiple facilities are not captured under one capability and developing and implementing a process to validate data input by the Centers into NTCD. What is the current status of the implementation of these recommendations? Do they appear to have made a difference?

Answer: In response to our audit report, the Associate Administrator for Mission Support stated that NASA plans to implement processes for validating data in the NASA Technical Capabilities Database or alternative databases by September 2014. We plan to evaluate these actions upon completion.

6. Your February 2013 report cited political interference as an impediment to NASA being able to manage its infrastructure. Many of the cases of political interference you mention in your report pertain to facilities necessary for the development of Constellation or its successor, the Space Launch System and Orion. Do you interpret the Administration's cancellation of the Constellation program against Congress' approval as "political interference?"

Answer: No. However, as we note in our audit report, because decisions about which facilities NASA needs are heavily dependent on the missions it is asked to perform, frequent changes in the direction of the Nation's space policy complicate the task of managing the Agency's infrastructure.

7. What are the potential risks and benefits of providing NASA with conveyance authority? How can Congress ensure that this authority is not abused?

Answer: We have not conducted audit work related to the potential use of "conveyance authority" and suggest this question would be better directed to NASA.

8. Would NASA's infrastructure management benefit from the establishment of a Capital Fund?

- a. If a Capital Fund is to be established, should it be administered at Headquarters or at the Centers?
- b. Should funds derived from a particular Center stay at that Center?
- c. What oversight measures would you recommend be put in place?

Answer: Similarly, we have not conducted audit work related to the establishment of an Agency Capital Fund and suggest this question would be better directed to NASA. However, NASA has received income from Enhanced Use Leasing and the treatment of revenue generated from those leases may be relevant to this question. According to NASA guidance, proceeds from Enhanced Use Leases are deposited into NASA's Construction and Environmental Compliance and Remediation account, after which they are available for Agency use for 5 years. After covering the full costs of the lease, 35 percent of the

remaining funds are under the control of NASA Headquarters and the remaining 65 percent is available to the leasing Center for such purposes as maintenance, capital revitalization, and improvements of real property assets. Such improvements may be made to any real property at the Center, and are not limited to the facilities or infrastructure associated with the lease.

9. **A Space Agreement between a company named H211 (which operates aircraft for Google executives) and NASA allows the company to use Moffett Field at the Ames Research Center in exchange for the company conducting research aboard its aircraft and fair market payments. As a result of flying out of Moffett Field, H211 was able to receive reduced rate fuel from the Air National Guard.**
 - a. **Understanding that NASA did not provide the reduced rate fuel to H211 and that the service is no longer provided by the National Guard, how can NASA ensure that companies are not receiving sweet-heart deals like this in the future?**

Answer: NASA can ensure that private companies do not receive discounts to which they are not entitled by ensuring that the Centers understand and comply with Government regulations and Agency policies on providing goods and services. When pricing goods and services to non-Federal entities, NASA policy requires Centers to conduct a market analysis to ensure the Agency does not inappropriately compete with the private sector. We are currently completing a review that examines the leasing and fuel practices for H211 at Moffett Field.

10. **In your February 14, 2013, report on NASA's environmental remediation efforts at the Santa Susana Field Laboratory, you questioned "whether NASA's agreement to clean its portion of the SSFL to background levels is the best use of NASA environmental remediation funds, particularly in light of the expected use of the property and the Agency's need to address other higher-risk environmental issues." According to your report, NASA wants to spend an estimated \$200 million to clean the site to background levels, which is twice the cost of restoring it for recreational use. Your findings indicated that for NASA to spend \$200 million to restore the land to background levels could actually cause greater damage to the environment and archeological sites, create problems for local residents, and would prevent environmental remediation funds from going to other projects. You recommended that NASA should re-evaluate its agreement in order to meet environmental needs in a cost-effective manner. Was NASA's response to your recommendation sufficient?**

Answer: No. NASA declined to indicate whether it agreed or disagreed with our recommendation and consequently did not address whether it would reexamine its current approach to the planned cleanup as we suggested. Instead, the Associate Administrator stated the Agency would continue to work with California officials and local community stakeholders "within the requirements" of the agreement and at the same time will "make every effort to implement a [cleanup] program that will achieve both cost avoidance and protection of cultural and natural resources."

Questions Submitted by Rep. Donna F. Edwards, Ranking Member

1. What are the top three infrastructure challenges facing NASA, and what, if any, congressional actions would be needed to address them?

Answer: In our judgment, NASA's most significant challenges are: (1) the age and obsolescence of its facilities, (2) fluctuating and uncertain mission requirements, and (3) Agency culture and business practices that lead to decentralized facilities management and competition between the Centers. These and other challenges are discussed in our February 2013 audit report, "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities."

Age and Obsolescence of Facilities: A large portion of NASA's infrastructure was constructed in the 1960's during the Apollo era and nearly 80 percent of the Agency's facilities are 40 or more years old and beyond their design life. Since 2005, NASA's annual operations and maintenance costs for its facilities have increased 44 percent to \$567 million, and as of 2012 the Agency had more than \$2.3 billion in annual deferred maintenance costs. This aging infrastructure presents considerable risk to NASA's overall mission success as facilities degrade and become obsolete and considerably more expensive to maintain. In addition, continuing to delay essential maintenance projects poses a threat to the safety of personnel and equipment and will result in higher repair costs in the future.

Fluctuating and Uncertain Mission Requirements: Frequent changes in the direction of the Nation's space policy by Congress, the President, and the Agency have hindered the ability of NASA managers to determine which facilities will be needed to support NASA's mission needs. For example, NASA's Human Exploration and Operations mission has transitioned from the Space Shuttle Program to the Constellation Program to the new Space Launch System Program in just 6 years. Because decisions about which facilities the Agency needs are heavily dependent on the missions it is asked to perform, changes in direction complicate the task of managing NASA's infrastructure. In the absence of firm requirements stemming from a clear direction, NASA Programs and Centers often resort to a "wait-and-see" or "keep it in case you need it" approach to facilities management.

Agency Culture and Business Practices: Historically, NASA has practiced a decentralized approach to managing its infrastructure that creates rivalries between the Centers to compete for work from the Agency's major programs. This culture has fostered a propensity for Centers to build or preserve facilities that duplicate capabilities available elsewhere in the Agency or lack an identified mission use. For example, NASA currently has 36 wind tunnels at 5 Centers, 35 rocket test stands at 6 sites, and 40 large thermal vacuum chambers at 7 locations.

Potential Congressional Actions: To address these challenges, Congress should consider providing NASA additional funding for issues such as environmental remediation and recapitalization, establishing a clear and consistent roadmap for the Agency's direction, and enacting a facilities consolidation approach similar to the Department of Defense's Base Realignment and Closure Commission if the Agency's efforts to reduce its infrastructure are insufficient.

2. In December 2011, you reported that Center plans, which are integrated into an Agency Master Plan, were based on funding assumptions that are no longer valid and are missing required information.
- Has NASA addressed this issue or does NASA have a plan to address this issue?
 - How confident are you that the Master Plan is reflective of NASA's true needs and condition?

Answer: NASA's first Agency-wide Master Plan issued in 2011 was based on Center plans that, in turn, were based on funding assumptions that are no longer valid. However, since that time NASA has updated its guidance to ensure clear linkages between projects and Agency or Center goals in the Center Master Plans. The revised guidance also specifies the documentation that must be incorporated into the Center Master Plans and requires Centers to address both institutional and programmatic funding. Proper compliance with the new guidance should ensure that future Master Plans are more reflective of NASA's Agency-wide needs.

3. Your prepared statement references Federal law and policy that prohibit NASA from leasing facilities for which it has no current or future mission-related use.
- What are the specific laws and policies that contain those prohibitions?
 - Do you believe that NASA should be exempt from such provisions? If so, which ones?

Answer: Our August 2012 audit report, "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices" noted that Title 40, United States Code (U.S.C.), Section 524, requires each Executive agency to maintain adequate inventory controls and accountability systems for property under its control, continuously survey property under its control to identify excess property, and promptly report excess property to the Administrator of General Services. With respect to NASA, Congress noted in the 2010 NASA Authorization Act that the Agency needs to re-scope and, as appropriate, down-size its physical footprint and directed it to develop a strategy to evolve toward the most efficient retention, sizing, and distribution of facilities, laboratories, test capabilities, and other infrastructure consistent with its mission. Additionally, NASA Procedural Requirements 8800.15B, "Real Estate Management Program," June 21, 2010, requires NASA Centers to identify property that does not meet a current or future mission need and take actions to dispose of unneeded real property.

The decision whether to exempt NASA from such provisions is a matter for Congress to decide. Nonetheless, it is important to note that while leasing can generate revenue to offset facilities operations and maintenance costs while reducing the Agency's deferred maintenance liability, entering into lease agreements for property that has no identified future mission use cuts against the Agency's efforts to reduce its real property footprint and diverts attention and resources away from its core space, aeronautics, and science missions.

- 4. Your office's February 2013 report on NASA infrastructure recommended that NASA complete the Technical Capabilities Assessment. Why is this Assessment important for NASA and how is your office monitoring NASA's response to the recommended action?**

Answer: NASA's Technical Capability Assessment is designed for each Center to identify its core capabilities followed by a process in which Center assessments are evaluated and ranked against the near term needs of the Mission Directorates and the future needs of the Agency. According to the Associate Administrator for Mission Support, the process will work by ranking capabilities at the Center, Mission Directorate, and Agency levels. Based on those rankings, Agency officials will determine if certain capabilities require further evaluation. For example, if a Center capability such as Launch Operations scores a low ranking on Center, Mission Directorate, and Agency level assessments, Agency officials may determine it warrants further review and consideration for consolidation or excessing.

In response to our February 2013 audit report, "NASA's Efforts to Reduce Unneeded Infrastructure and Facilities," the Associate Administrator stated that NASA plans to continue work on the technical capabilities assessment and incorporate its methodology into NASA policy by September 2014. We plan to evaluate these actions upon completion.

- 5. Your office assessed NASA's real property leasing practices in August 2012.**
- a. What are the advantages and disadvantages of leasing or arranging for commercial users to operate and use NASA facilities? Have such advantages or disadvantages been demonstrated in actual NASA leasing activities, and if so, how?**
 - b. What are the potential risks to the Government of commercial use leases?**
 - c. What are the issues for Congress as NASA seeks to increase its use of leasing out its facilities and infrastructure?**
 - d. How does NASA ensure that the leasing terms adequately protect the taxpayers?**

Answer: Our August 2012 audit report, "Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices" found that leasing underutilized real property has several benefits. First, leases may generate revenue the Agency can use to help reduce overhead expenses and defray the costs of maintaining and improving aging infrastructure. Second, leasing enables NASA to retain facilities that although currently underutilized may be needed for future missions.

Despite these benefits, leasing has several potential risks that Congress should be aware of as NASA seeks to expand its leasing efforts. First, NASA must be careful to ensure that leasing does not replace its responsibility to dispose of property that is no longer required to meet current or future mission needs. Entering into lease agreements for property that has no identified mission use cuts against the Agency's efforts to reduce its real property footprint and diverts attention and resources away from its core space, aeronautics, and science missions. For example, our audit report noted examples at Ames Research Center and Glenn Research Center where the Centers entered into long-term leases involving land that should have been, in our judgment, excessed in order to reduce the Agency's real property footprint.

A second potential risk with leasing is that poor implementation and execution could result in NASA not realizing the program's full benefits or lead to financial losses to the Agency. For example, our audit found that of the eight "in-kind" Enhanced Use Lease agreements we reviewed, NASA did not receive any benefit from one agreement and received limited benefits from three others.

Another risk for leasing to commercial entities is the potential to inappropriately compete with the private sector. Our audit report examined instances where market analyses were not conducted before lease agreements with non-Federal tenants were signed. In one case, we determined that the Agency undercharged the tenants, which gave the tenant an unfair cost advantage over its competitors and resulted in NASA unfairly competing with private industry by charging less than prevailing market rates.

As NASA considers expanding its leasing agreements to help manage its infrastructure, enhanced guidance, training, and documentation will help ensure that the Agency is receiving the highest possible benefits from its lease agreements and that the agreements are made in the most transparent manner to ensure fairness.

Questions Submitted by Rep. Derek Kilmer

- 1. What is the cost to complete modifications to LC 39B to make it a multi-user facility? What is the dollar amount of this cost that will be borne by the US taxpayer? How much will be borne by any commercial users that would use LC 39B? How long is it expected to take?**

Answer: According to NASA officials, although the modifications the Agency has made to turn Launch Complex 39B into a “clean pad” make it more amenable to accommodating multiple users, NASA did not make the modifications for that purpose. Rather, NASA began modifying Launch Complex 39B in 2010 as part of the Constellation Program to support the launch of the Ares I rocket and Orion crew exploration vehicle. As part of those modifications, NASA decided to implement a “clean pad” concept which meant that unlike the Shuttle Program, Constellation would not require any support structure on the pad. The work to remove the support structure from the pad was completed in 2011.

Additional modifications to the pad are now underway to support the Space Launch System, and NASA plans to adhere to the “clean pad” concept. According to the President’s FY 2014 Budget Request, NASA is in the third of a four-phase project to modify Launch Complex 39B estimated to cost \$86.5 million. The third phase is scheduled for completion in June 2016. Because modifications to Launch Complex 39B date back to Constellation and include both those that are program specific and those that support the “clean pad” concept, NASA is in a better position than the OIG to provide a breakout of the costs specific to making the pad a multi-user facility.

To date, all modifications to Launch Complex 39B have been paid with NASA funds. While it is likely that commercial users will require additional modifications to accommodate their launch vehicles, modifications will depend upon the specific configuration of the rocket being launched. Consequently, it is not possible to determine how much those additional modifications will cost until a decision is made regarding which vehicles will be launched. Currently, NASA does not plan to fund additional modifications to the pad that may be needed to support launch of commercial vehicles.

We intend to examine many of these issues as part of our ongoing audit of NASA’s launch infrastructure and modernization efforts at Kennedy Space Center.

Questions Submitted by Rep. Joe Kennedy III

- 1. As you highlighted in your written and verbal testimony, because many of NASA's facilities need significant upgrades, I am seeking clarification on where the funds to upgrade these facilities come from. If NASA is leasing or selling a property to a specific entity, will that entity pay for any upgrades? When a site is expected to be multi-user and shared by NASA, do the taxpayers solely pay for any required upgrades, or is there shared contribution by the entities that will be using the facility?**

Answer: If NASA is leasing or selling a property to a particular entity, that entity usually pays for any needed upgrades. Our August 2012 audit report, "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices" highlighted instances where the tenants paid for upgrades to property leased from NASA. For example:

- Planetary Ventures leased 42 acres of undeveloped land at Ames to develop business and research-related facilities on the property. NASA is receiving both cash and in-kind consideration in the form of infrastructure improvements under this agreement.
- University Associates leased 77 acres of land at Ames to develop business, education, research, and housing facilities on the property. The agreement calls for NASA to receive both cash and in-kind consideration for infrastructure improvements.
- Bloom Energy renovated a building it occupies at Ames and H211 removed a skywalk in the hangar it leases at Moffett Field. NASA accepted the cost of these renovations as in-kind payment. Although these in-kind benefits were not clearly mission related, these are short-term agreements and the improvements could benefit NASA if the properties revert to the Agency.

When a site is expected to be multi-user and shared by NASA, payment of upgrades is a shared responsibility. In general, if the upgrades are required for a NASA program or another Government entity, taxpayers pay. If the upgrades are required for a non-Government entity, that entity pays for the upgrades.

- 2. Many of NASA's facilities are national assets that took significant taxpayer investment to construct. They are unique and matched by no other facilities in the world. How will you ensure that the process to transfer or share these facilities is fair and open?**

Answer: Our August 2012 audit report, "NASA's Infrastructure and Facilities: An Assessment of the Agency's Real Property Leasing Practices" recommended that NASA revise existing policy or develop new policy to: (1) require that Federal entities be considered for leasing opportunities and that NASA coordinate with the General Services Administration to identify potential Federal tenants, and (2) require that leasing opportunities be widely publicized. We believe that as NASA considers expanding its leasing agreements to help manage its infrastructure challenges, enhanced guidance will help ensure that the Agency is receiving the maximum possible benefits from its lease agreements and that the agreements are made in the most transparent manner to ensure fairness.

Questions Submitted by Rep. Steve Stockman

1. Inspector, you as well as many other NASA and industry leaders, know that a significant contributing factor in the tragic Space Shuttle Columbia and Challenger accidents was found to be the business “culture” and stifled communications from staff level and technical employees up through program management, Agency and industry senior-level decision makers when concerns or issues regarding safety and mission assurance were raised. BOTH accidents could have potentially been averted. Most notably, Shuttle Columbia was specifically lost due to a hole knocked in the vehicle’s Thermal Protection System (TPS) or outer vehicle shell, during the launch.

Given the criticality of the TPS for a space vehicle, we are deeply concerned as to why NASA would choose to close, one of only two of these crucial TPS test facilities in the U.S., in this case, the JSC arc jet. Even more puzzling is the fact that the decision to move forward with the closure commenced, despite numerous concerns raised over the past two years by TPS and safety experts, as well as many Members of Congress. In addition, the criticality of TPS and need for NASA to maintain this testing capability has been clearly conveyed through several reports and assessments conducted by NASA’s Chief Engineer, the National Academy of Science, Safety and Mission Assurance Experts, TPS experts, and the NASA Engineering & Safety Center TPS/Arc Jet Tiger Team.

Last year, before arc jet transition was scheduled to begin, you were cc’d on two letters sent to the NASA Administrator and signed by 30 bipartisan House Members. These letters detailed numerous concerns relative to safety, cost, capability loss, and mission assurance – referencing explicit data from several reports and assessments.

However, according to the report you released earlier this year, “NASA’s Efforts to Reduce Unneeded Infrastructure and Facilities” (Feb 2013), you cited that one of the major issues hindering NASA’s efforts to reduce its property footprint was “political pressure,” specifically using the JSC arc jet as the primary example. Additionally, the rationale provided in your report for closing the JSC arc jet, was the same NASA HQ used in their decision making which was contradictory and erroneous in comparison to data we had obtained, which prompted our engagement and actions with NASA. To-date, we have yet to receive satisfactory responses from the Administrator, Safety and Mission Assurance leaders, including those from yours and Mr. Keegan’s recent testimony.

- a. In your testimony, you stated you were unaware and had not read the NASA S&MA MPCV TPS Briefing which was the primary focus of the April 2012 Congressional letter which you received. Why were you unaware of such a critical issue and piece of evidence supporting Congressional concerns? Did you ignore it and dismiss it as a “political or parochial issue”?
- b. Once you became aware of these issues, did anyone in the Office of the Inspector General investigate any of the concerns stated in the Congressional letter(s)? If so, please provide us a copy of your findings? If not, why not?
- c. During the hearing, you mentioned “safety was paramount” and that funding was never a reason to risk safety. In the month since the hearing, have you reviewed

the S&MA briefing you mentioned you would, and/or any of the other letters and attachments previously sent to you from Congress?

- i. Do you still believe the issues raised by Congress and many other experts are purely political?
- ii. After understanding more about the criticality of this unique testing facility and the implications relative to safety and mission assurance, do you believe closing this facility and reducing to only one arc jet is the right decision?
- iii. Are you aware that the findings and recommendations stated in the S&MA were concurred by a Safety Council, which includes JSC Director of S&MA? Are you aware that this concurrence was redacted after NASA HQ became aware of the briefing and issues raised during the Congressional staff meeting? Do you believe this immediate reaction represents a “culture of safety” and trust within NASA, between the Centers and Headquarters and between Program leadership and staff?

Note: After the Congressional meeting, we understand that NASA employees involved in the arc jet and S&MA issues were warned about communicating with Congressional staff without HQ approval. Again, not a “healthy culture and open communications process that would ensure employees felt comfortable bringing issues to senior and program leadership? Employees are paralyzed...terrified to speak up because they fear reprisal in a very weak economy and job market.

Answer: An audit team from the Office of Inspector General had reviewed the briefing packet prepared by Dr. Pulsonetti and presented to the Safety Technical Review (STR) Board on March 8, 2012. In fact, as part of our audit of NASA’s Orion Multi-Purpose Crew Vehicle (MPCV) program our team met with Dr. Pulsonetti to discuss NASA’s plans to transfer the Arc Jet facility at Johnson Space Center to the Ames Research Center. Dr. Pulsonetti reiterated the concern that transferring the facility could negatively impact NASA’s ability to conduct tests on the Orion MPCV’s heat shield. The OIG audit team considered this information together with data and information from a variety of other sources. We concluded that NASA’s decision to close the Arc Jet facility at Johnson Space Center in phases and ensure that Ames Research Center had the testing capability required by the Orion MPCV program before stopping that capability at Johnson Space Center adequately addressed Orion testing needs.

2. The following is an excerpt from your report:

“Political Pressure....Over a year later in February 2012, 30 members of Congress, almost of all of whom represented Texas, sent a letter to the NASA Administrator requesting that the Agency suspend any action to close the facility until they had an opportunity to meet with NASA officials and review the situation. NASA officials met with the Members in April 2012 and attempted to assure them that consolidating Arc Jet facilities at Ames would not result in significant testing downtime or a reduction in Agency capability. However, the Congressional members were not convinced and in a subsequent letter strongly urged the NASA Administrator to halt any action to

dismantle the Johnson Arc Jet until it could be determined that consolidating the facilities would not adversely impact testing of the Orion Multipurpose Crew Vehicle. As of the date on our report, the Agency planned to consolidate Arc Jet capabilities at Ames through an incremental approach that will maintain testing capability at Johnson through 2013 or until the Ames Arc Jet is completely operational."

- a. Relative to your statement above...were you fully briefed after the "meeting with NASA officials"? The NASA representatives were not prepared with answers, were unaware of the safety concerns raised as well as the concerns raised by engineering and TPS experts. Consequently, the meeting which was attended by both Senate and House NASA committee oversight and Member staff resulted in more questions that were answered, which prompted a lengthy Congressional follow-up letter with an attachment detailing numerous questions and requesting that the transition be postponed until there was clear understand of the issues and Members were satisfied this issue was not creating a critical safety and/or mission assurance issue.
 - i. Why did NASA dismiss Congressional requests and continue to move forward with the closure; this is not a vacant warehouse or unused office building, nor is there ANY other domestic back-up option in the U.S.? The back-up options stated in the letter of response from Headquarters, as well as during the staff meeting, do not meet the requirements to do the required testing – their data was inaccurate and misrepresented the facts.
 Note: During the meeting, one option blurted out by NASA staff was the utilization of an international arc jet in Italy (CIRO)...then the statement was immediately rescinded stating "that was not an option being considered." Ironically, several months later, NASA Ames issued a sole source agreement (JOFOC) for arc jet testing using the Italian arc jet.
 - ii. Were you aware that the Chairman of the House CJS Appropriations Subcommittee, during a May 2012 colloquy on the House floor, specifically called for the closure to be put on hold until it could be further investigate?
 - iii. Do you agree with NASA's action to disregard Congressional direction to halt the transition despite formal requests to do so?
- b. Are you aware that the transition, which began in May 2012 and was scheduled to be completed in Oct 2012, is more than a year late and that NASA Ames has been unable to consistently operate the facility with the transferred equipment?
- c. Are you aware that it has been critical to keep the JSC arc jet operating and performing critical TPS testing to keep both Orion and commercial systems development on schedule because of the transition and operations problems at Ames?
- d. Given the issues, do you remain confident in this decision to close this facility and reduce to only one facility? This one test facility is critical to safety, mission assurance and can render a space vehicle unable to fly to inability to certify for flight.

Answer: As discussed above, the OIG believes that NASA took adequate steps to ensure the testing needs of the Orion Program were met. The questions you raise regarding NASA's decision to move forward with the transfer of the Arc Jet facility despite objections from some members of Congress are more appropriately addressed by NASA rather than the OIG.

3. **When you conducted your 2011 audit, did you assess the needs of the Orion and/or commercial entities which all require access to the arc jets for critical certification tests?**
 - a. According to the timing of Constellation being cancelled in the President's 2010 budget, and the facility needs assessments conducted by the Agency and Centers, the JSC arc jet was not considered in these "future needs assessments." Did anyone think of reassessing needs once the Orion program was reinstated? If so, what was the recommendation or conclusion?
 - b. Were you aware that there were two commercial providers who expressed the need and preference to use the JSC arc jet because of cost and capabilities?
Note: Another discrepancy in data shared with staff was the costs of tests, facility operations and staff required for the ARC and JSC arc jets.
 - c. Is there a reason why this facility was not one of the NASA facilities that could have been considered by HQ and JSC for commercial leasing and usage versus closure?
 Arc jet testing is required on a large majority of human and robotic space systems and would enable NASA to retain this very critical capability.

Answer: As noted above, we considered Orion's testing needs as part of our audit of that Program. Your other questions are more appropriately addressed to NASA.

4. **Arc jets, which are high energy test facilities, are very unpredictable and often malfunction, resulting in cessation for hours, days and even months.**
 - a. Are you aware that NASA has no domestic back-up test facility capable of conducting the type of TPS testing required by Orion, commercial systems and many of the robotic vehicles?
 - b. Are you aware of Orion's current problems with its TPS...making it one of the Program's highest risk systems at this time?

Answer: As noted above, we believe that NASA has adequately addressed the testing needs of the Orion Program. Questions regarding backup capability are better addressed to NASA.

5. **Were you aware of the sole source procurement issued by Ames last October to the Centro Italiano Ricerche Aerospaziali, or CIRA in Italy for TPS testing services?**
 - a. Why would Ames need to solicit TPS testing services from an international provider versus simply continuing use of the JSC arc jet and maintaining this capability here in the U.S.?

- b. Aren't their logistical challenges, as well as significant cost and schedule increases procuring services internationally?

Answer: The OIG has not reviewed any agreement between NASA and the Italian government. Questions about any such agreement are more appropriately addressed to NASA.

6. Are you aware that Congressman Paul Broun, Chairman of the House Subcommittee on Investigations and Oversight sent a letter to the GAO Comptroller General last October, regarding significant concerns and allegations of export control violations at NASA Centers, with particular focus on an investigation at Ames?
- a. Are you aware that TPS technology is ITAR restricted?
 - b. Based on emails and data we received of exchanges between ARC Director Pete Worden and former AA for Mission Support Directorate, Dr. Woodrow Whitlow...are you aware that Ames leadership and staff have made several trips to Italy over the past couple years?
Note: This is a major concern brought to our attention by employees – concerns over ITAR violations?
 - c. Were you aware that trips to Italy were partially being driven in an effort to look into moving the CIRO arc jet equipment to the U.S.? Where would funding come from to support such an initiative(s)?
 - d. Are you aware that the CIRO arc jet is based largely on the technical designs of Ames and that Ames subcontractors served as advisors to the development and marketing to international and "Pac Rim" organizations?

Answer: We are familiar with Chairman Broun's October 25, 2012, letter to the Comptroller General requesting a review of NASA's export control program. We understand that in response to the Chairman's request the Government Accountability Office is conducting the review.

7. The NASA Authorization of 2010, PL 111-267, Sections 1102 and 1103, required NASA to conduct an Institutional Requirements Study, which was driven NASA's action to consolidate, retire, outsource and revitalize various facilities.

However, the language in Section 1105 states "Prior to receipt by the Congress of the study, recommendations, and implementation strategy (sic) Are you aware that TPS technology is ITAR restricted strategy developed pursuant to Section 1103, none of the funds authorized for use under this Act may be used to transfer the functions, missions, or activities, and associated civil service and contractor positions, from any NASA facility without authorization by the Congress to implement the proposed strategy."

- a. To your knowledge, do you believe NASA complied with the law?

- i. **If you believe they have, can you share the timing and circumstances? With a copy of the study, recommendations and implementation strategy, along with the date it was submitted, by who from NASA HQ and to whom in Congress?**

Note: According to emails we obtained that were exchanged between HQ, Centers, procurement and infrastructure functions, actions were taken to “fast track” closure of this facility, including the transferring of funds allocated to other Centers for “high priority infrastructure modifications creating safety hazards.”

- ii. **If you don’t believe they have complied and fully met this obligation, why were actions taken by NASA to close facilities? Wouldn’t that mean they did not comply with the law?**

Answer: The OIG is not aware of any allegation that NASA did not comply with the law in connection with the transfer of Arc Jet facilities. NASA may be able to provide you with additional information about this issue.

Responses by Mr. Richard Keegan

Questions for the Record
September 20, 2013, Hearing on NASA Infrastructure
before the House Science Committee, Subcommittee on Space

Questions submitted by Chairman Palazzo

- (1) How does NASA determine whether or not it has a future need for a facility or property?
- a. Is this a consistent formalized process that NASA uses to evaluate all infrastructure, or does NASA determine its infrastructure needs on a case-by-case basis?
 - b. If NASA follows a formal process for determining whether the agency needs a given facility, please provide a reference to that policy or guidance.

Response: Yes, NASA has a consistent formalized process upon which each decision is made. NASA Procedural Requirement (NPR) 8800 outlines the process for excessing real property that the Agency determines is no longer required for mission purposes -- determination of infrastructure requirements are made on a case-by-case basis. NASA uses various methods and processes to determine the future Agency requirements for facilities or property. Decisions on future requirements for assets are based on studies conducted to analyze NASA mission requirements versus current and projected capabilities. These studies include budget and workforce management; master planning, mission program requirements and interactions with Centers and institutional stewards at Headquarters.

- (2) After NASA has determined it no longer has a need for a facility, or that the facility is underutilized, does NASA have standard criteria and a formal process for selecting what disposal or out-granting mechanism to use?
- a. What type of oversight provisions exist to ensure that this process is not manipulated or taken advantage of?

Response: When facilities are no longer required for NASA's use, they are disposed according to the various authorities available to NASA. Excess property is disposed through the General Services Administration (GSA) disposal process or demolished under delegated demolition authority from GSA. Underutilized facilities are dispositioned depending on their future mission requirements and their appropriateness for utilization by others. Oversight of disposal or out-granting of NASA's facilities is provided by the Office of Strategic Infrastructure, Mission Support Directorate in accordance with NPR 8800. NASA has a range of authorities available to out-grant underutilized facilities. The selection of the authority to use to make facilities available to third parties is made on a case-by-case basis, depending on the facility, its function and location. Processes and procedural guidance are in place for pursuing each of the various out-granting mechanisms. More recently, NASA has initiated process improvement studies to evaluate its processes for out-granting NASA facilities to commercial industry.

- (3) The Committee is aware of several authorities available to NASA for it to manage its infrastructure. These include (but are not limited to) Space Act Agreements,

Enhanced-Use Lease, contracts, leases, grants, and cooperative agreements. Please provide a comprehensive list of all of the authorities available to NASA.

Response: NASA's use of available Federal authorities depends upon the status of a given property's utilization within the Agency's real property portfolio (i.e. whether the property has been administratively determined to be excess to NASA's mission needs, for instance, or is not excess, but underutilized.) Depending on the desired end state for the property, NASA can dispose of excess property through the GSA excess process or demolish excess property through delegated authority from GSA. GSA's Public Benefit Conveyance and Exchanging Building for Services authorities offer additional avenues for disposing of excess properties. To accomplish goals for the management of underutilized facilities, NASA's Centers utilize several Federal authorities to conduct out-grant (leasing) activities. These include:

- (1) The National Aeronautics and Space Act ("Space Act") authorizes NASA to enter into agreements using its "other transactions authority." 51 USC § 20113(e). These agreements, commonly referred to as Space Act Agreements (SAAs) may be reimbursable or non-reimbursable, and are often used by NASA to enter into real property out-grant agreements. SAAs for out-grant activities may also be called Licenses or Use Permits.
 - a. NASA has leasing authority under the Space Act as well -- 51 USC § 20113(c)(3). Under NASA regulations Space Act leases cannot provide for less than "fair value of money" consideration for the use of a property.
 - b. Access and use of property may be provided through concession agreements as authorized under the Space Act, 51 USC § 20113(k).
 - c. NASA has authority to cooperate with Federal agencies and others in the use of NASA facilities under the Space Act. 51 USC § 20113(f).
 - d. NASA has authority to provide access to NASA facilities as part of its cooperative activities with international partners under the Space Act, including 51 USC § 20102(d)(7), 20113(e) and 20115.
 - e. The Space Act also provides authority for NASA to enter into Enhanced Use Leases (EUL), which can be used by NASA to enter into out-grants for non-excess, underutilized Agency real property. EULs are based on fair market value cash consideration, with the exception of agreements for the implementation of renewable energy production facilities, for which the Agency may accept in-kind consideration. NASA may retain EUL cash proceeds to cover its full leasing costs, as well as for maintenance, capital revitalization and/or improvements to real property assets.
- (2) The National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470) permits NASA to out-grant historic property and retain proceeds to defray the costs of administration, maintenance, repair, and preservation. The NHPA also allows for a tenant to make improvements at the tenant's expense.
- (3) The Economy Act of 1932, as amended (31 U.S.C. 1535,) provides authorization for Federal agencies to request and perform reimbursable work for other Federal agencies, including the utilization of NASA real property services by another Federal agency, simply described as interagency out-grants. A Federal tenant is required to pay their proportionate share of the costs of operating the asset and for any special services provided.

- (4) The Commercial Space Launch Act (51 U.S.C. 50913(a)(1)) encourages the acquisition by the private sector of launch or reentry property of the U.S. Government that is excess or otherwise not needed for public use. For lease agreements under the CSLA, NASA charges only its direct costs, which are those costs that NASA would not otherwise incur absent the partnership activity.
 - (5) The Commercial Space Competitiveness Act, 51 USC 50504, authorizes Federal agencies to allow non-Federal entities to use space-related facilities on a reimbursable basis.
 - (6) The National Energy Conservation Policy Act, as amended by the Energy Policy Act of 1992 (42 U.S.C. 8201 et seq.), provides authority for Federal agencies to implement energy efficiency improvements through the use of the following contract mechanisms: (1) Energy Savings Performance Contracts (ESPC), through which an Agency engages with an Energy Service Company to obtain an energy audit, consultation, design and installation of energy upgrades without up-front expense. This mechanism allows the Agency to incur debt for the cost of these improvements that will be paid back through guaranteed energy and water cost savings over the term of the contract. At the end of the contract, additional cost savings accrue to the Agency. (2) Utility Energy Service Contracts (UESC) enable an Agency to participate in similar energy-efficiency, water-conservation, and electricity-demand programs offered by gas, water, or electric utilities. An Agency may implement an ESPC or UESC with no initial capital investment or may use appropriated funds strategically to maximize the impact of its project.
4. **Are NASA's current processes for out-granting or disposing of property sufficient?**
- a. **Does NASA need new authorities?**
 - b. **Does an existing authority need to be altered in order to facilitate better infrastructure management?**

Response: NASA believes that its present complement of Federal real property management authorities are sufficient, thus providing a robust set of tools for addressing the Agency's infrastructure management and utilization challenges. As NASA continues its efforts to balance and align its infrastructure with evolving mission requirements, this "tool box" will also continue to afford a variety of approaches for the Agency to pursue opportunities for beneficial utilization of its assets. NASA's use of its out-grant authorities, in particular, has expanded and evolved in recent years from a historic focus on providing for co-location of activities of other compatible Federal agencies to provide economies of scale for execution of agency missions. Presently, most of NASA's Centers and component facilities engage in some level of out-grant activity, which has been undertaken to better utilize NASA assets through partnerships with private industry, educational institutions, and other entities that can benefit and support the Agency's mission.

With regard to expansion of authorities, the recent expansion of NASA's existing EUL authority, which allows the Agency to accept in-kind consideration for the implementation of renewable energy production facilities, will enable NASA to attract industry to establish such facilities on its Centers. This provides the opportunity to the Agency to enhance utilization of assets that are either underutilized or can serve dual, compatible purposes that support NASA's research and commercial renewable energy production. Implementation of these energy production projects will further assist NASA in complying with energy and greenhouse gas requirements. NASA will continue to seek opportunities to use this authority, and will continue to rely upon its

existing portfolio of authorities to work towards the achievement of Agency infrastructure management goals.

With regard to new authority, NASA has proposed two new authorities, which would enhance its ability to out-grant and dispose of property in a way that permits NASA to facilitate the development of the U.S. commercial space industry. The first, as discussed below in Response 5, would provide NASA with the same authority recently granted to the Department of Defense (DOD) to more effectively partner by accepting funds, services and equipment from commercial partners in connection with the use and development of space transportation infrastructure. The second authority, as discussed further in Response 17, would permit NASA to better ensure that property no longer needed for Government use is reutilized to support the development of the U.S. domestic space industry.

- 5. Does NASA allow for in-kind payments for use of NASA infrastructure and facilities?**
- a. Are in-kind payments allowed under certain authorities but not others?**
 - b. If they are not allowed under certain authorities, how would expanding this authority impact current agreements or contracts at NASA facilities in general, and at Stennis Space Center (SSC) specifically?**

Response: As discussed in Response 3, NASA has a number of authorities under which it is authorized to provide access to or use of NASA's infrastructure and facilities. Some of these required cash payments at fair market value and some are more flexible. For example, NASA's authority to lease non-excess property (EUL) at 51 USC 20145 requires cash consideration at fair market value, except for those leases for the purpose of developing renewable energy production facilities. However, NASA also has reimbursable authority under the Space Act and may waive costs under those agreements when the partnership provides an in-kind benefit to NASA. NASA engages with its international partners on the ISS for barter arrangements under which no funds are exchanged and all payments relating to the operation of the ISS between partners are in-kind. Additionally, the Commercial Space Launch Act, 51 USC 50913, authorizes NASA to provide access to launch and reentry property at direct cost.

Recently, DOD received expanded authority to engage in cooperative activities with commercial partners, which permits DOD to accept funds, services and equipment from commercial partners in connection with the use and development of space transportation infrastructure. (See 10 USC 2276.) NASA needs and *has requested* the same flexible authority to work with commercial partners to develop and maintain infrastructure located on NASA Centers, which is capable of supporting both government and commercial users. Although there are some differences between DOD's current authority and NASA's request, Centers with significant space-related assets, such as Stennis Space Center (SSC), would especially benefit from this expanded authority as requested by NASA.

- 6. How does NASA allow companies, universities, and other non-federal agencies the opportunity to use land and/or facilities on SSC?**

Response: As detailed in Response 3, NASA has many authorities by which it may allow companies, universities and other non-Federal agencies the opportunity to use land and/or facilities at SSC. Specifically, SSC partners with its various tenants through either an Enhanced

Use Lease agreement (EUL) or a Reimbursable Space Act Agreement (RSAA) pursuant to NASA's Space Act authority. SSC generally utilizes EUL agreements to provide facility space to commercial companies, whose activities are aligned with, but not directly supporting, the NASA mission. NASA ensures that all tenant agreements are in compliance with the Administrative Services Act of 1949, the Space Act of 1958, NPR 8800.15, NPD 1050.1 and NPR 9090.1, as applicable.

7. How does NASA determine the fees or reimbursement for services and maintenance on NASA facilities?

- a. **How is this currently determined for the various authorities utilized by the SSC?**
- b. **Are the authorities and fees consistent for all non-NASA entities that utilize SSC infrastructure?**

Response: NASA's policy, in chapter 4 of NASA Procedural Requirement (NPR) 9090.1, directs that charges for reimbursable agreements be assessed based on the applicable authority. For example, agreements based on the Space Act other transaction authority (OTA) (51 U.S.C. §20113(e)) or the Economy Act (31 U.S.C. §1535) are charged at actual (i.e., full) cost, while fees for agreements under the Commercial Space Launch Act (51 U.S.C. §50901) are limited to direct costs and Enhanced Use Lease agreements are based on fair market value (51 U.S.C. §20145) per the statutes. Pricing for Reimbursable Space Act agreements under NASA's OTA authority may also be adjusted based on an approved waiver or, in limited cases, market-based pricing when specified criteria are met.

- a. SSC follows NASA's policy utilizing the prescribed pricing under NPR 9090.1 based on the applicable authority.
- b. As noted in Response 6 above, SSC agreements with its tenants typically utilize the EUL, OTA or Economy Act authorities. As described above, reimbursements are based on the prescribed pricing for the applicable authority, and these are applied consistently to all tenants at SSC.

8. How much do Centers communicate with each other (as well as with the private sector) about whether an asset could be shared between Centers or utilized by the private sector? What is Headquarters' role in such communications?

Response: NASA's real property management guidance has long included a procedural requirement for Centers to provide Agency-level notification when they reach a determination that they no longer have a mission requirement for a real property asset. The Headquarters Office of Strategic Infrastructure provides screening opportunities for all other NASA Centers to consider such sites for other mission uses prior to an Agency excess determination.

On a more comprehensive scale, however, the implementation of NASA's master planning process, as well as governance improvements, such as the establishment of an Agency-level council to afford integrated senior management review of mission support decisions (including key facility determinations), has strengthened mission alignment and provided avenues for greater coordination and communication between and across the Centers and Headquarters. Further, Agency-level studies and programs such as those noted in Response 1, provide the

cross-Agency data and findings necessary to inform decisions about integrated utilization of NASA's Center assets.

9. What "success stories" has NASA seen with regards to out-granting an underutilized property to an outside entity? How could lessons learned from those processes be applied to discussions regarding the fate of Launch Complex 39A, Shiloh, or other underutilized facilities?

Response: NASA continually assesses whether Agency processes are effective and seeks to capture lessons learned that can be applied to future events. The following are several successful examples of underutilized NASA property being used by other entities:

- (1) NASA's Ames Research Center (ARC) in California has more than 60 agreements with private industry, academic and non-profit entities. Five companies that started in the NASA Research Park (NRP) at ARC with only technology and a plan, are now employing thousands in Silicon Valley: Bloom Energy, Tibion, Apprion, Nanostellar and Benetech. These firms represent very diverse areas such as green tech (fuel cells), life sciences (bionic leg), communications security (wi-fi ion shield), material sciences (nano coatings) and technology assistance to persons with disabilities. The many universities located in the NRP, especially Carnegie Mellon University and Singularity University, not only have onsite degree programs, but are vitally involved in assisting graduate students to develop new startups.
- (2) SSC and Aerojet Rocketdyne (formerly Rocketdyne, and then Pratt & Whitney Rocketdyne) entered into an Agreement for use of the southeastern corner of Building 9101, for assembly, storage, and build-up of rocket engines. The design of the modifications to the building was coordinated with NASA, and the State of Mississippi collaborated in making the modifications possible. Providing this capability in close proximity to the test facility at SSC was a major benefit to the RS-68 Program, as efficiencies were enhanced, allowing crew "flexing" and minimizing delays and travel time for test hardware to and from the test stand. Over time, additional rocket engine programs have been consolidated and are now jointly serviced out of this Assembly Facility, supporting several different kinds of rocket engine hardware and contributing to further sharing and reduction of costs.
- (3) In the 2004/2005 timeframe, Rolls Royce made a decision to expand its testing network worldwide, and selected the H-1 facility at SSC as the site of its newest crosswind and acoustic test facility. Following a redirection of NASA mission requirements, the H-1 facility had been placed in mothball status and incompletely outfitted for mission use. Rolls Royce made major investments in outfitting the facility. Since that initial investment, the business case for Rolls Royce to continue to expand its footprint at SSC supported expansion and creation of a second test stand. The State of Mississippi was a partner in this expansion to a second Rolls Royce test stand at SSC.
- (4) NASA's Kennedy Space Center (KSC) has and continues to out-grant underutilized properties to external entities. KSC has executed several use agreements to repurpose facilities that can be used by commercial entities to encourage and foster commercial space and launch activities. Using authority provided under the Space Act, NASA has

executed use agreements with Space Florida for the Orbiter Processing Facility 3, Space Shuttle Main Engine Processing Facility and the Processing Control Center.

- 10. Based upon what you have heard from Langley Research Center and Kennedy Space Center's updates to their Center master Plans, how much change has there been from the Master Plans drafted in 2009? Which aspects of the Master Plan have seen the most change? Which have stayed consistent? Are there lessons that can be learned regarding possible changes to other Centers master plans?**

Response: Considerable changes affecting these two Centers are in fact the drivers for master plan updates at each Center. A considerable change in the role of the KSC, given the end of Space Shuttle operations and the commercialization of access to space, required an update to their previous master plan. These two Centers reflect the changes in complexity and diversity of NASA's capabilities. While resources and demand forecasts vary from center to center, one common lesson is that renewing needed capabilities in the smallest footprint practical is still a useful organizing principle for such change. Both master plans are being revised to address the changing mission requirements and to identify plans for achieving the Centers' mission in a smaller and more integrated footprint.

- 11. Reducing unneeded infrastructure has been a goal for almost two decades, yet little progress has been made toward achieving this goal. What elements of NASA's process for reducing unneeded infrastructure could be changed to create a better and more effective system? What other roadblocks do you see to reduction of unneeded infrastructure?**

Response: Like all Federal agencies, NASA is challenged with implementing its infrastructure management goals within a budgetary environment that can be difficult to predict. NASA's infrastructure was largely constructed during or before the Apollo era. While our facilities are generally well designed and constructed, age and changing mission requirements have affected the resilience and usefulness of many of our facilities. Therefore, the Agency is carefully prioritizing its efforts to sustain continued and significant progress toward the most efficient and prudent stewardship of its physical infrastructure. For example:

- NASA initiated and has maintained an active demolition program since 2004, which has been an important part of NASA's plans to reduce its infrastructure and operating costs. Since FY 2013, NASA has demolished or disposed of 104 facilities. This eliminated \$2.6M in annual operations and maintenance requirements and \$22.9M in deferred maintenance.
- NASA is currently focusing on evaluating infrastructure that supported the retired Space Shuttle to determine which facilities have no future need and demolishing or disposing of those facilities. Since 2008, NASA has disposed of 131,000 square feet of unneeded facilities at KSC, including the Mercury Control Center, the Vertical Processing Facility, Hangar S South Annex, Central Heat Plant, and Merritt Island Launch Area S-Band radar facilities. An additional 236,000 square feet will be demolished in the near future.
- NASA has returned the Palmdale Orbiter processing site to the Air Force, decommissioned the White Sands Space Harbor and is in the process of demolishing Orbiter related facilities at NASA's Dryden Flight Research Center.

- In addition to demolition, NASA is eliminating unneeded facilities through transfer to other agencies or sale through GSA. Recently, NASA worked with GSA to successfully sell two large office buildings and land at the Glenn Research Center. This eliminated the cost and burden to NASA while making serviceable buildings available to industry in a location that has ideal access to the Cleveland airport. NASA will continue to explore the disposition of land and structures through sale when it is economically feasible. NASA is also actively removing leased space from its inventory. In 2012, NASA closed leases that resulted in a savings of just over \$1M in rent.
- During development of the Orion Crew Vehicle and the heavy-lift Space Launch System, NASA is limiting the development of new facilities, focusing on modifying existing facilities to meet program requirements. This is also true of the James Webb Space Telescope Program, where NASA facilities were modified to meet testing, development, and fabrication requirements in lieu of constructing new facilities.

Today, NASA's infrastructure decisions are guided by an Agency Facilities Strategy (defined in 2009) along with a 20-year Agency Master Plan that informs implementation of this strategy. This plan stated, "NASA will renew and modernize its facilities to sustain its capabilities and to accommodate those capabilities in the most efficient facilities set predictable." For example, the Agency is learning how best to manage assets across all Centers in a less stove-piped, more strategic and integrated fashion, through a rigorous Corporate Portfolio Management process. In doing so, NASA has established an Agency-level Mission Support Council to integrate senior management review of decisions within the mission support portfolio, ensuring that mission requirements and facility investment are better synchronized. Additionally, we have established collaborative planning partnerships between Center and Headquarters officials in order to ensure strategic facility goals are realistic based on budget availability.

Additionally, in July 2012, NASA stood up a Technical Capabilities Assessment Team (or "TCAT") under the leadership of the Associate Administrator that was charged with developing a process for identifying and assessing each Center's technical capabilities against the current and future needs of the Agency. The team is working to identify areas for potential capabilities divestment or investment due to changing mission needs and/or duplication of current resources. Once complete, the team's analysis will be used from a facilities perspective to inform future Agency master planning activities and to support future strategic facility investment decisions.

In summary, NASA believes that our strategic infrastructure approach, aligned with mission requirements and guided by well-integrated risk management practices, provides the best framework for achieving the Agency's infrastructure goals in the most cost-effective manner over time.

12. Does the process for reducing unneeded infrastructure function better at the Headquarters level or at the Center level? Are there any responsibilities at Headquarters that should be transferred to the Centers (or held by Centers that should be transferred to Headquarters)?

Response: A partnership between Headquarters and Centers and their internal components and organizations remains essential to ensuring that NASA's built assets are evaluated on their merits

now and later. Adjustments to the way the Agency manages its infrastructure are made from time to time. Recently, the Agency has taken the lead to review and validate facility requirements across the Agency to ensure that critical capabilities are not lost and to ensure that duplication and reduction of capabilities are managed with an Agency perspective. Some examples of this are an Agency-wide prioritization of Construction of Facilities investments, the establishment of test alliances (including the Aeronautics Test Program and Rocket Propulsion Test Program), Strategic Capabilities Asset Program, the NASA Capability Forum process, and the Technical Capabilities Assessment Team. Such changes do not eclipse the Center role in identifying, assessing, and implementing needed changes, but instead recognize that better decisions result from a process that also considers perspectives external to an individual Center.

13. NASA is in the process of out-granting the Shuttle landing facility, but no appreciable progress has been made. Why has this process taken so long? Is NASA missing statutory authority to transfer this facility?

Response: NASA announced on June 28, 2013, that it would start discussions with Space Florida toward a partnership agreement to maintain and operate the historic Shuttle Landing Facility (SLF). (See <http://www.nasa.gov/centers/kennedy/news/releases/2013/release-20130628.html>.) NASA and Space Florida are currently in discussions and are making progress toward a mutually beneficial arrangement that will support economic development through full utilization of the SLF for both aviation and aerospace activities in a manner that is consistent with the ongoing and anticipated operations of KSC as a government and commercial launch facility. No additional NASA authorities are required to out-grant this facility.

14. Can you speak about Langley's 20-year revitalization plan to remove twice as much infrastructure as they build? What prevents other Centers from implementing such a program?

Response: As noted in Response 11, NASA has established collaborative planning partnerships between Center and Headquarters officials in order to ensure strategic facility goals are realistic based on budget availability. NASA's master planning process functions as an interactive framework for communication between Centers and Headquarters. It works best when each party participates in framing objectives and evaluating proposed changes to ensure that the resulting path is a coherent response to local, Agency, and national aerospace requirements. Headquarters works with Centers when circumstances change such that a master plan update is advisable.

Consistent with its Vibrant Transformation to Advance Langley (ViTAL) plan, Langley Research Center intends to continue to reduce its footprint and is updating its 20-year facilities master plan. While the drivers for the Langley initiative and master plan update (focusing the workforce on highest-value contributions, partnering with many external partners when advantageous and adapting to changes in demand for certain research and development work) apply at any Center, the particulars of the change at one Center are too diverse to apply across all NASA Centers. Each Center works with Headquarters to chart an internally and externally coherent path. Still, several other Centers are monitoring Langley Research Center's progress so that they might incorporate pertinent elements into their own change management.

15. Understanding that it is an evolving effort, what is the current status of the Agency Master Plan? What is the next step in the plan's implementation?

Response: The plan remains a framework for evaluating facilities management strategies Agency-wide. As noted in testimony, some Centers are updating their components now, and other strategic planning processes continually evolve as do budget circumstances. At present, the best course is to pursue these change initiatives to a point at which their broad implications are evident; and in the meantime to support Centers pursuing local updates to their plans in response to immediate change drivers.

16. At present, how does NASA coordinate mission needs and funding with the private sector and other agencies such as the Department of Defense regarding use of wind tunnels and other facilities for aeronautics research? How could this coordination be improved?

Response: NASA participates in the National Partnership for Aeronautical Testing (NPAT) -- a council co-chaired by NASA and the Department of Defense. The council's charter is to develop an integrated strategy for the management of national aeronautics test capabilities and to enable national cooperation and coordination.

The NPAT initiative has led to an agreement on the guiding principles for facility pricing and access, the inventory and technical assessments of U.S. wind tunnels, the improved understanding and collaboration between operators and users from Government and industry, and the establishment of a national force measurement technology capability.

NASA makes aeronautic testing capabilities available for use by external customers and, in general, employs a direct-to-test rate charging system to recover revenue critical to the continued operations of the testing capabilities. The stated priority is NASA first, but coordination issues are worked and usually a schedule can be developed that accommodates all users.

17. NASA's legislative proposal for disposal of personal property for use in commercial space transportation services and space-related activities includes the stipulation that sale of such property be accompanied by written designation that the property be "used and maintained by the purchaser solely for the purpose for which it was sold, will be utilized to support the development and delivery of space-related activities and space transportation services, and shall not be further sold or transferred except as part of the sale of all or substantially all of the assets of the purchaser."

- a. Do you foresee difficulty with enforcement of this measure? Are there variations in state law that could affect enforcement from state to state?
- b. What would be the punishment for violation of this measure by the property holder?
- c. Are there other means for achieving the same goal (ensuring that NASA property is used for the development of space-related activities and space transportation)?

Response: This proposal would provide authority for NASA to support U.S. commercial providers of space transportation services and space-related activities by providing a mechanism to transfer excess Federal property directly to such providers through disposal after the property has been reported excess to NASA's needs. The proposed legislation would authorize sale of property to support the development of the U.S. commercial space industry upon appropriate determination by the Administrator once the property has been reported excess by NASA. Any property subject to sale under the proposed legislation would be subject to reasonable competition and would require that the Administrator determines appropriate consideration for any sale.

- a. NASA does not foresee difficulty in enforcing a requirement that excess NASA Property provided under the request and authority be used only to support the development and delivery of space-related activities or a requirement that downstream sale of the property be limited. NASA currently has several mechanisms for which it may provide or loan government property to a non-government entity. Under the Federal Acquisition Regulations (FAR) and the NASA FAR Supplement, NASA contractors are required to maintain accountability for property in their possession under the contract. Similarly, NASA loans Government property to museums, educational institutions in commercial partners under agreements which place appropriate management, inventory and reporting requirements for the loan property on the recipient. NASA anticipates a similar approach for excess property transferred under the requested authority.
- b. Because NASA would retain an interest in the transfer of property title to the requirement for appropriate use, any attempt to inappropriately utilize our transfer of the property would permit NASA to terminate the transfer and reclaim the property as Government-owned property.
- c. The established Federal process, administered by the General Services Administration (GSA) currently permits sales to any qualified interested party. Other than to satisfy certain legal requirements, the GSA generally does not limit who can purchase an item or how it may be used after sale. As a result, the current process requires flight hardware and other commercially useful property to be offered to entities whose purposes may not be aligned with further improving U.S. domestic space capabilities before commercial space companies would have the opportunity to bid on the property. Even then the high bidder is not required to reuse the property in the most effective manner. NASA's objective is to preclude the possibility that some of these items, which could still be used for productive space-related activities, could be "lost" to entities who simply want to collect them, scrap them or repurpose them for unrelated uses.

18. What is the problem with the current process of reporting excess property to the Government Services Administration (GSA)? How can this process be streamlined?

Response:

The process for reporting excess Federal property to the GSA, established pursuant to the Federal Property and Administrative Services Act Of 1949, as amended (40 U.S.C. 524) is

appropriate in ensuring proper disposal of U.S. Government property. However, as discussed above, the GSA does not limit who can acquire property or what the recipient does with it once it is transferred. NASA believes that repurposing an existing space-related property so that it can be used to support the U.S. and domestic space industry is an effective use of taxpayer assets, which provides U.S. economic benefit beyond the value the taxpayer might receive if the property was simply auctioned to the highest bidder.

19. How has the practice of Enhanced-Use Leasing benefited NASA's infrastructure management? Are there any negative impacts to enhanced use leasing?

Response:

NASA utilizes its EUL authority as a tool to support appropriate and responsible management of its real property. Since there are facilities that are currently underutilized but are unique assets to the Agency, NASA considers EUL a tool to aid in the preservation of these non-excess assets, rather than allowing them to fall into disrepair. In 2013, NASA was able to award \$3.7M in facilities repairs and energy management projects using net proceeds from enhanced use leases. EUL supported vital work such as replacing roofs, retro-commissioning nine facilities and installing energy efficient lighting. The use of EUL agreements has enabled NASA to reduce the maintenance burden and improve facilities that support the mission of NASA's Centers.

While NASA has not experienced any negative "impact" to its infrastructure management goals as a result of utilizing EUL agreements, the Agency recognizes that EUL may not be the most appropriate authority for every potential out-lease. Accordingly, NASA looks at each opportunity to out-grant underutilized facilities on a case-by-case basis, depending on the asset and its potential use. The use of other authorities may offer more flexibility, or a more suitable construct for a given type of agreement.

20. What additional authorities does NASA need to more effectively utilize its facilities and right size its infrastructure?

Response:

Please see response to Question 4.

21. Would NASA's infrastructure management benefit from the establishment of a Capital Fund?

- a. If a Capital Fund [sic] to be established, should it be administered at Headquarters or at the Center?
- b. What oversight measures would you recommend to be put in place?

Response: NASA has a working capital fund (WCF), which includes the authority to receive appropriated amounts or transfers in of assets and inventories. See 51 U.S.C. sec. 30102. NASA's policies (see, e.g., NPR 9095.1) provide processes for review of new business cases to add activities to the WCF, as appropriate. Certain buildings at SSC have already been added to and are being managed within the WCF. NASA does not have any business cases pending for

which an expansion in its WCF authority would be required, nor do we currently foresee a need to expand this authority.

22. Does NASA have plans to promote and support the Infinity Science Center (ISC) at NASA Stennis Space Center?

- a. If so, by what means will SSC provide financial or other support?**
- b. If not, has NASA discussed options with the Infinity Science Center Board to sever or alter ties with the Science Center?**

Response: When SSC executed a Non-Reimbursable Space Act Agreement (NRSAA) with the INFINITY Science Center (ISC) in 2012 upon the completion of the building, an Annual Program Plan (Plan) was also negotiated. The NRSAA and Plan provide guidance on the specific roles and operational responsibilities of NASA and ISC. Specifically, the Plan demonstrates SSC's commitment to promoting and supporting ISC in its role as the official NASA SSC Visitor Center.

NASA SSC does not provide direct financial support to ISC, as NASA has neither the budget nor the authority to expend appropriated funds for this purpose. To the extent that ISC serves as NASA SSC's official Visitor Center, NASA provides in-kind support, as appropriate. For example, NASA-owned exhibits currently provide the content for the Visitor Center and SSC contractors are responsible for managing the public tours from ISC. NASA SSC also contracts for space at ISC for educator workshops, youth camps and large offsite meetings by SSC and its tenants to ease security concerns and to meet capacity requirements.

23. If NASA were to take ownership of, or alter its relationship with the Infinity Science Center in any way, how would the transfer work and what impact would that potentially have on the SSC budget?

Response: NASA has no current plans to take ownership of the Infinity Science Center. Accordingly, NASA has not reviewed whether such a transfer would be possible or what the budgetary impact would be.

24. Has NASA evaluated potential options to share, loan, out-grant, or sell exhibit assets such as full-scale rockets or unused, old, excess engines or other hardware with Infinity Science Center (ISC)?

- a. Are there any plans to contribute additional exhibit assets to ISC?**

Response: Yes. While there are prohibitions/restrictions on out-granting or direct sales to the ISC, NASA continually evaluates potential options to share and exhibit artifacts at the ISC.

NASA's SSC exhibit manager works closely with the ISC and takes every opportunity to reach the public through artifact exhibits at the ISC. During the transition and retirement of the Space Shuttle Program, 24 items were requested by the SSC Exhibit Manager for public exhibition. Most of the items are currently on display at the ISC, and preparations are underway to display the remaining items. These include the following:

- Apollo items: Neil Armstrong's Extravehicular Mobility Unit (EMU) Suit and David Scott's Integrated Torso Limb Suit Assembly.
 - Space Shuttle items: Drag Chute Door; Window Retainers; Display Unit; Hand-held Mic; Cassette Video Recorder; Functional Cargo Block Docking Probe; Torque & Force Analyzer; Power Supply; Pouch; EMU National (USA) Flag; Astro Garden Assembly; Glove Assembly; G-Shock Crew Watch; Core Temp Pill Kit; Logbook; Red Cleat Cycling Shoe; Stowage Pouch; Activity Monitor; Crewmember Short Sleeve Shirt; Laptop Computer; Accutracker Manuals, Guides & Software; and Accutracker Blood Pressure Monitor.
- a. On an on-going basis, NASA artifacts are screened by eligible recipients at a website (<http://gsaxcess.gov/NASAWel.htm>) jointly administered by NASA and the GSA. NASA Exhibit Managers as well as eligible museums and schools can view and request the artifacts. Furthering NASA's support to the ISC, the NASA Exhibit Center on the SSC is being phased out and a significant number of artifacts, including an F-1 Apollo engine and an H-1 engine have been moved to the ISC. The SSC Exhibit Manager provides ongoing support to the ISC, and is continually on the lookout for items to enhance the museum experience for visitors.

25. Has NASA ever made exceptions or waivers to the NASA Acoustic Buffer Zone at Stennis Space Center?

a. Please provide the NASA Acoustic Buffer Zone restrictive easement limitations.

Response: NASA SSC does occasionally grant a waiver to its restrictive easement, in the form of an agreement documenting our consent to locate habitable structures in the Buffer Zone. Requests for waiver are strictly scrutinized to determine whether the structure: (1) must be located inside the Buffer Zone to achieve its stated purpose; and (2) represents the minimum amount of enclosed space required for the operation. Requestors must provide sufficient evidence of both requirements before a waiver will be granted. NASA's easement reserves to Buffer Zone landowners all right, title, interest, and privilege as may be used and enjoyed without interfering with the rights, title and interest taken for public purposes. To the extent NASA SSC can accommodate otherwise acceptable uses of the Buffer Zone (e.g., mining, logging, etc.) by allowing small structures, waivers are granted in a manner that is consistent with NASA SSC's established policies. It should be noted that the granting of a waiver is typically considered to be the exception, rather than the rule.

- a. The NASA restrictive easement reads, "A perpetual and assignable easement for the establishment, maintenance, operation and use of a restricted area in, on, across, and over the land included in [the Buffer Zone], consisting of the right to prohibit human habitation or human occupancy of dwellings and other buildings, and the right to prohibit the construction of dwellings and other buildings susceptible of being used for human habitation or human occupancy; together with all right, title, and interest (except as hereinafter listed) in and to the dwellings and other buildings now situated on the land and which are susceptible of being used for human habitation or human occupancy, including the right to demolish, remove, relocate, or leave in place said dwellings and other buildings; the right to post signs indicating the nature and extent of the Government's control; and the right of ingress and

gress over and across said land for the purpose of exercising the rights set forth herein; subject, however, to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the landowners, their heirs, executors, administrators, successors (if corporate owner), and assigns all right, title, interest, and privilege as may be used and enjoyed without interfering with or abridging the rights, title, and interest hereby taken for said public uses.”

26. What plans does NASA Stennis Space Center have for the Army Ammo Plant buildings?

a) Are these buildings fully utilized?

Response: NASA SSC continues to aggressively pursue new tenants for the viable, unoccupied space at the former Mississippi Army Ammunition Plant, which is now known as “Area 9.” At least 15 potential Government and non-Government tenants have visited SSC over the past 12 months to view the facilities and discuss possible occupancy.

Current SSC tenants, such as the Department of Homeland Security and Aerojet, have also expressed interest in expanding their current footprints by occupying additional space in Area 9. Additionally, NASA successfully negotiated the out-grant of space to new tenants while continuing to provide support services to the legacy tenants that have occupied Area 9 space since prior to the facility’s transfer to NASA in 2011.

NASA SSC is also in the process of demolishing facilities in Area 9 that were used solely for ammunition production, require significant repairs, or are otherwise not viable for new tenants. NASA SSC also continues to successfully operate the National Center for Critical Information Processing and Storage (NCCIPS) as a Federal shared services data center in Area 9. Over the past 18 months, NCCIPS has added new customers including the GSA, the NASA Shared Services Center, SSC Information Technology systems, and the Federal Highway Safety Administration. NCCIPS currently has approximately 40,000 square feet of data center space available and continues to pursue new Federal customers requiring the use of sensitive, critical or classified IT systems.

- a. There is a total of 1,481,477 square feet available for occupancy in Area 9; 774,354 square feet of that total is currently occupied. Buildings 9100 and 9101 are the largest vacant facilities, comprising approximately 527,610 Sq. Ft. (9100: 239,029; 9101: 288,581) of the total 707,123 square feet of unoccupied space in Area 9.

27. What process did NASA use to determine that LC-39A was not necessary?

a. What SLS launch rate did NASA assume in this process?

Response: The availability of LC-39A and LC-39B for other users is the result of a thorough assessment of NASA’s programmatic requirements for these capabilities as well as the need to maximize the portions of NASA funding that can be applied directly to NASA missions versus the sustainment of infrastructure. Unlike the Space Shuttle, Space Launch System (SLS) payloads, including the Orion Multi-Purpose Crew Vehicle (MPCV), will be integrated with the rocket before the rocket is rolled to the pad, as is the case with many modern rockets such as the

Atlas V, Ariane 5, and Falcon 9. This "clean pad" approach, in addition to reducing the amount of costly infrastructure required at the launch pad, will dramatically reduce the amount of time the SLS will spend at the pad for each launch. Accordingly, even at launch rates considerably higher than forecasted for SLS, LC-39B will have a considerable amount of availability for other uses, and a second pad for SLS is not needed. This "clean pad," multi-use approach is an important tenet of NASA's affordability approach for SLS, and modifications to upgrade LC-39B have been supported by FY 2011-2013 appropriations. This transformation is expected to be completed by February 2017.

As such, NASA has determined that there is no prospective Agency programmatic requirement for the launch capacity at LC-39A. This determination resulted from a number of assessments that began as early as 2009, as part of Shuttle Transition and Retirement planning, and continued through planning for requirements for SLS and Orion MPCV. These assessments included an internal disposition review process that included a survey of all NASA Centers and programs for the purpose of identifying all potential or alternative Agency uses for the facility. In May 2013, it was determined that funding to maintain LC-39A would be terminated at the end of FY 2013. Without funding to maintain the facility and no commercial partner to assume its operation, NASA would be required to dispose of LC-39A by abandonment in place. In the salt-rich environment at KSC, rapid deterioration beyond the possibility for refurbishment is a real threat if the facility is not diligently maintained. Therefore, as the end of FY 2013 approached, shutdown activities toward a "mothballed" state began.

- a. The current NASA baseline is for the first launch of the 70 metric ton capability SLS on EM-1 in 2017. The second launch, EM-2 (also of the 70 metric ton SLS) is scheduled for 2021. After EM-2, the baseline plan is for an SLS launch every two years, starting with EM-3, with a surge capability of up to three flights per year, depending on mission requirements.

28. What authority is NASA using to lease LC 39-A?

Response: NASA's Announcement for Proposals (AFP) for industry to operate and maintain the LC-39A, released on May 23, 2013, provides that the LC-39A lease award will be made under the Commercial Space Launch Act (CSLA) or the Space Act. The CSLA authorizes the Federal government to "facilitate and encourage the acquisition by the private sector...of launch or reentry property of the United States Government that is excess or not otherwise needed for public use...." (51 U.S.C. § 50913).

29. In general, what factors does NASA consider in ruling on whether to grant an exclusive lease vs. a multi-user lease (as has been discussed with regard to Launch Complex 39A)?

Response: On May 23, 2013, NASA issued the AFP for LC-39A. The AFP for LC-39A reflected NASA's goal to provide the greatest flexibility for industry partners to define their most advantageous concept of operations and to assure a fair and open competition and includes the evaluation factors for selection. Respondents were invited to propose either an exclusive-use or multi-user concept of operation. NASA did not preselect any operational concept.

On December 13, NASA selected Space Exploration Technologies Corporation (SpaceX) of Hawthorne, CA, to begin negotiations on a lease to use and operate LC-39A. NASA's source selection statement, which outlines factors used in selecting SpaceX to enter into negotiations, is available at: <http://prod.nais.nasa.gov/cgi-bin/eps/bizops.cgi?gr=D&pin=76#159268>.

NASA is now in the early stages of working with SpaceX to negotiate the terms of its lease for LC-39A. NASA will not be able to discuss terms and conditions of the pending lease agreement publicly until the conclusion of negotiations.

30. Who will make the decision for LC 39-A—personnel at KSC or NASA Headquarters?

Response: The Associate Administrator of NASA's Mission Support Directorate was the selecting authority.

31. Before NASA decided to request proposals for LC 39-A it determined that it did not have a need for the facility. LC 39B is the facility that will be used for the Space Launch System. If something were to happen to that pad (which is not unheard of for new launch vehicle developments) what is NASA's back-up plan for SLS?

Response: NASA recognizes that issues can arise with new launch vehicles. In the case of the SLS, the Agency purposely chose to utilize previous taxpayer investment on propulsion systems such as the five-segment motor from Constellation/Ares and the RS-25 from the Space Shuttle Program. This significantly reduces the design and development risk. NASA is developing a new Core Stage for SLS and is utilizing all the best standards and design practices to minimize the development risk. The Core Stage will be tested at SSC prior to integration in the SLS vehicle at KSC.

Past experience with rocket engine testing and launch vehicle flights has shown that if an issue occurs on Pad 39B, any repairs required for the pad will be encompassed by the work associated with addressing launch vehicle issues. It is also important to recognize that NASA has developed the vehicle processing and launch flow consistent with the available funding. The processing flow is also limited to one bay in the Vehicle Assembly Building, one crawler/transporter, and mobile launch platform.

At this time NASA sees no need for Pad 39A for SLS.

32. How can NASA better engage with the private sector and other agencies to better utilize NASA test stands?

Response: NASA is actively engaged with many alliances and partnerships, such as the National Partnership for Aeronautics Testing, and National Rocket Propulsion Test Alliance. NASA is also working with federal and commercial sectors to benchmark best practices, understand the needs, current capabilities and capacities that exist, as well as potential capability gaps and future work. NASA is actively seeking partnerships with the private sector, making available to industry under-utilized assets at NASA's Centers that may be utilized by the private sector to advance the development of the Agency's mission and the development of U.S. commercial space and aeronautics programs. Examples include use agreements with Space

Florida, the out-grant of the Neutral Buoyancy Laboratory at the Johnson Space Center (JSC) and the U.S. Air Force use agreement for the 40x80 wind tunnel at ARC.

33. When will Arc Jet operations be fully transferred to the Ames Research Center?

Response: The Arc Jet Complex at ARC has been fully and continuously operational throughout the lifetime of the Orion Program (and its predecessor, Constellation) for test support of many NASA, Government, and commercial customers including the Orion, Mars Science Laboratory, Space Technology Mission Directorate technology development, SpaceX, Lockheed-Martin, and DOD entities. The infrastructure at ARC supports routine operations of 20 and 60 megawatt arc heaters; the infrastructure is sized to support arc heaters up to 100-megawatt power. Installation of the 10-megawatt arc heater from the JSC has been completed at ARC and is being operated today to verify its applicability to Orion testing needs.

34. Will the Ames Arc Jet Facility be capable of fulfilling all of the needs of the Orion heat shield testing? How did the consolidation affect the schedule for testing Orion's heat shield?

Response: Yes, the ARC Arc Jet Facility is capable of fulfilling all the needs. The consolidation did not affect the testing schedule.

Prior to and during consolidation, the Orion Program has been a significant user of the Arc Jet Complex at ARC. Orion test requirements were established through extensive technical review by JSC, ARC, and Orion engineering and operations personnel. Currently, a test program is underway to verify that the requirements established through that review process have been met. Progress during the verification testing has been excellent and greatly assisted by extensive collaboration between JSC and ARC personnel. The testing has been reviewed by a panel of management and program chief engineers and subject matter experts representing JSC and ARC arc jet operations, TPS engineering, and Orion program management. The test program is expected to be completed in late January and results reviewed by program and operations personnel. The consolidation has had no impact on the Orion test scheduling. The JSC test facility has remained available to support the Orion program during the consolidation process. The ARC test facility has maintained test operations in sections of the test complex unaffected by consolidation activities and has executed every scheduled test on time.

35. On August 27, 2013, NASA announced it had selected a contractor to replace the Arc Jet Complex Steam Vacuum System (SVS) Boiler at NASA Ames Research Center in Moffett Field, CA.

a) Why was this replacement necessary?

b) Were the replacement costs included in the assessment of where to consolidate Arc Jet facilities?

- a. The existing SVS Boiler was fabricated for seagoing (U.S. Navy) operations in the mid-1940s and installed at ARC in 1961 for arc jet operations. It is being replaced for reasons that are unrelated to arc jet consolidation. While its operation today is robust, the design is long obsolete; fuel efficiency is poor and spare parts and replacement components are often difficult to procure, requiring custom fabrication or design modification to execute

repairs. The design of the original boiler precludes further modification of its design and control systems to operate at modern standards of reliability, fuel efficiency, and environmental compliance.

- b. Although SVS Boiler replacement was not motivated by arc jet consolidation, infrastructure replacement costs were included in assessing the location of the consolidated arc jet testing assets. The assets already operating at Ames are essential for current and future NASA mission needs.

Two consolidation options considered were (1) transfer JSC test capabilities to ARC, or (2) transfer ARC test capabilities to JSC. The infrastructure at ARC is sized to support 100-megawatt arc heater operations; currently installed heaters can operate up to 60 megawatts. The equipment transferred from JSC to ARC is a 10-megawatt arc heater. Its installation in the 100-megawatt class ARC facility is a minor load on the existing test infrastructure. No infrastructure modifications were necessary to accommodate its installation and full power operation, and normal test operations proceeded during the installation process. The total cost for this equipment transfer and installation is approximately \$6M.

In contrast, the infrastructure at JSC is sized to support 10-megawatt arc heater operations. Installing a fully operational 60 megawatt arc heater at JSC (and preserving the capability to run to 100 megawatts) would not be possible with the current capacity of the JSC arc jet infrastructure. Transferring ARC capabilities to JSC would require replacing and upgrading the Johnson steam vacuum system (including boiler), high voltage power systems, high pressure air storage systems, high pressure circulating cooling water systems, integrated control systems, and associated horizontal infrastructure to house and operate the arc heaters currently operating at ARC. The JSC facility would have been out of service until all construction activities were completed. The construction cost estimate for this upgraded facility was approximately \$375M, considerably more expensive than the \$6M cost for the selected consolidation option.

36. In the Inspector General's February 14, 2013, report on NASA's environmental remediation efforts at the Santa Susana field laboratory, the IG recommended that NASA reexamine its environmental remediation agreement to better meet environmental needs in a cost-effective manner. Specifically, the report questioned the expenditure of \$200M to restore the property to background levels, which was beyond the recommended level for what the land was to be used for. Further, the IG's findings said that restoring the land to those levels would actually cause greater environmental and archaeological damage to the site.

- a. **Why wouldn't the Associate Administrator follow the IG's recommendations? What is the justification for spending \$200M instead of \$25M on environmental remediation?**

Response: NASA's Office of Strategic Infrastructure and Santa Susana Field Laboratory (SSFL) project personnel continue to review and evaluate the SSFL cleanup program to find options for cost avoidance and better protection of the cultural and natural resources at the site. These options include working with California Department of Toxic Substances control (DTSC), the

State Historic Protection Office, the tribes, and local interested community members to find effective and efficient ways to implement the December 2010 Administrative Order on Consent (AOC). The AOC requires NASA to meet cleanup standards set by the DTSC. NASA will continue to work with the DTSC to effect a cleanup in accordance with the AOC.

Questions from Congresswoman Edwards

1. What are the top three infrastructure challenges facing NASA, and what, if any, congressional actions would be needed to address them?

Response: NASA believes that our strategic infrastructure approach, aligned with mission requirements and guided by well-integrated risk management practices, provides the best framework for achieving the Agency's infrastructure goals in the most cost-effective manner over time.

The Agency's top three infrastructure challenges are:

1. The nature and quantity of NASA's onsite work is changing. The demand for any R&D organization's capabilities changes with incremental trends such as the evolution of mission/program techniques and interest areas, the capabilities of external parties, and changing funding levels/purchasing power. Periodic strategic changes (such as concluding Space Shuttle operations, developing the SLS, and commercializing access to orbit, for instance) combine with these incremental trends to create a "moving target" against which to align NASA's infrastructure.
2. Our physical infrastructure faces pervasive end-of-life issues. About five-sixths of NASA's built systems were constructed over forty years ago, few of which have been systematically renewed since their construction. As a result, progressive deterioration of NASA's built infrastructure has been trending upward toward unacceptable levels in the long-term.
3. NASA's nationwide configuration limits its ability to scale infrastructure as demand changes. NASA's history impelled large-scale operations in more locations than would most efficiently conduct its current work. This is to be expected for an organization that comprised 4.5 percent of the Federal budget at a point in the 1960's, but less than 0.5 percent today, and causes NASA to steward more infrastructure than it otherwise would.

2. The Technical Capabilities Assessment is an effort to identify and evaluate Center capabilities against current and future agency needs. However, as a follow-up to a July 2013 briefing to Committee staff, NASA indicated that the Technical Capabilities Assessment is an ongoing effort with no specific completion date.

- a) What is the status of the Assessment and is there a target date for completion?
- b) Are there plans to incorporate the Technical Capabilities Assessment team's resultant methodology into standard NASA policy and practice?
- c) What are some examples of how the Technical Capabilities Assessment Team study will provide useful information to the Master Planning activity?

Response:

- a. The (TCAT), operating under the authority of the NASA Associate Administrator, has developed a process for a comprehensive technical capability assessment which will

identify and evaluate Center technical capabilities against the current and future needs of the Agency. The TCAT is making steady progress toward assessing technical capabilities, providing input to Agency decisions on disposition of assets.

- b. The plan is to integrate the TCAT resultant methodology into standard NASA policy and practice.
 - c. Effective management of NASA technical capabilities is essential to the success of all NASA current and future programs. The TCAT will identify and evaluate Center technical capabilities against the current and future needs of the Agency with the goal of maintaining a minimum set of Agency capabilities. This comprehensive assessment evaluates Center capabilities against strategic goals and long term needs, providing a documented alignment of technical capabilities, including infrastructure, to Agency needs. This information in turn feeds several areas in the Agency, including Master Planning, and allows Centers an opportunity to compare their current plan against future requirements.
- 3. Taxpayers have made considerable investments over the past fifty years in NASA and its infrastructure.**
- a. How does NASA assess whether infrastructure and facilities are unique national assets that need to remain viable?**
 - b. What is the process for handling such identified national assets?**
 - c. Are stakeholders external to NASA consulted?**

Response:

- a. NPR 8800 outlines the process for excessing real property that the Agency determines is no longer required for mission purposes -- determination of infrastructure requirements are made on a case-by-case basis. NASA uses various methods and processes to determine the future Agency requirements for facilities or property. Decisions on future requirements for assets are based on studies conducted to analyze NASA mission requirements versus current and projected capabilities. These studies include budget and workforce management; master planning, mission program requirements and interactions with Centers and institutional stewards at Headquarters. No single process exists to arrive at appropriate decisions for the management of all of NASA's unique infrastructure assets. It is the interaction and distillation of a number of Agency policies, processes, and internal studies and analyses that provide the information necessary to make prudent real property management decisions. Further, as we have detailed, NASA has a variety of legislative authorities in its "toolbox" to support the pursuit of beneficial outcomes for both real property utilization and revitalization.
 - b. As we have noted previously, NASA is engaged with many alliances and partnerships, (including private and Department of Defense alliances) such as the National Partnership for Aeronautics Testing, and the National Rocket Propulsion Test Alliance. NASA is also working with federal and commercial sectors to benchmark best practices, understand the needs, current capabilities and capacities that exist, as well as potential capability gaps and future work.
- 4. Each of NASA's missions--aeronautics, science, human spaceflight and exploration--require, to an extent, unique infrastructure and facilities suited to meet different**

mission objectives. How, in NASA's planning, prioritization, and decision-making on facilities and infrastructure does NASA ensure balance across all of its mission areas?

Response: The importance of balance drives a continuing Agency trend toward more integrated or "corporate" decision-making approaches. NASA Centers were organized to serve a single mission; today Centers generally provide services to many missions. The simpler prior model meant each mission could invest at particular Centers to manage risks (in this case, the risk that institutional failures could interfere with mission success) according to its individual tolerance; the more complex current model means that representatives of each mission must participate in a collective, agency-level calibration of risks. Current processes for assigning work to Centers and directing institutional resources to ensuring the best use across all NASA missions are responsive to this need for collaboration between the institution and all mission programs.

NASA uses risk assessments to evaluate the underlying infrastructure and determine the impact of infrastructure failure to various NASA missions. To balance across all mission areas, NASA does not prioritize or weight one mission over another but simply assesses impacts to all missions and operations. NASA also identifies each Center's core capabilities and the required infrastructure through Center master planning. NASA strives to modernize the infrastructure supporting Center capabilities at the same rate. Facilities requirements that are specific to a particular program are funded by the requiring program as part of the budget development process.

5. A 2012 report to the National Academies, NASA's Strategic Direction and the Need for a National Consensus, found that "Different policies and regulatory changes have to be applied to different NASA Centers. There is no realistic 'one-size-fits-all' approach." Do you agree with that conclusion? How do you reconcile the Academies' conclusion with NASA's move toward a more centralized, integrated master planning process?

Response: Developing strategic directions for institutional assets at NASA centers does not fit a "one-size-fits-all approach". The NASA master planning process strives for greater coordination and integration rather than centralization. While the Agency has expanded the Headquarters role in setting goals, policies, and metrics in an Agency Master Plan, facility master planning is still conducted locally, close to the work, to produce the best outcomes in facility planning. NASA strives for more consistency in the manner in which Centers develop, document, and communicate their master plans. Coordination among Agency leadership in evaluating and making investment decisions at the Headquarters level ensures a more strategic approach in ensuring program and institutional capabilities are sustained across the Agency to perform our Mission.

6. Following reference in your prepared statement to the May 2010 report by the National Research Council on NASA research laboratories, you state that NASA is evaluating the replacement of several laboratories that will support the Agency's future research needs.
- What is the name of this effort and by whom is it being conducted?
 - What is the basis for the definition of "future research needs?"

c. Are NASA and external stakeholders input and comment being accommodated for both this evaluation and subsequent decisions?

d. When is this evaluation scheduled to be completed?

- (a) Decisions to replace laboratories and other technical infrastructure are the result of the integration of facilities planning and master planning with the various strategic studies, and capabilities assessments conducted within NASA.
- (b) Studies and assessments such as the Arc Jet study conducted by the Chief Engineer, the NASA Capabilities Forum, the assessment to modernize the space communications network conducted by the Space Communications and Navigation program, the Langley Research Center ViTal study and the JSC 2.0 study are used as input to NASA's master-plans and facilities plans to determine the infrastructure NASA will need in the future and to determine the timing of facilities upgrades or replacements so that the infrastructure continues to support NASA research.
- (c) Within NASA these evaluations are continuous and iterative so that they support budget development.
- (d) Decisions on replacement of laboratory facilities and the timing of the replacement are made by NASA's Mission Support Council and Executive Council.

Question from Congressman Kilmer

- 1. What is the cost to complete modifications to LC 39B to make it a multi-user facility? What is the dollar amount of this cost that will be borne by the US taxpayer? How much will be borne by any commercial users that would use LC 39B? How long is it expected to take?**

Response: As of the end of July 2013, NASA had spent \$46.1M in preparation for an SLS launch from LC-39B with consideration given to the planned evolution of the SLS vehicle. From FY 2014 through FY 2017, approximately \$143.1M is budgeted for this effort.

The specific cost to commercial users of LC-39B has not been determined but would be subject to a number of factors depending on the nature of the use. In general, commercial users will be required to reimburse NASA for costs associated with the use of launch property or services.

Development/redevelopment/modification costs incurred by NASA for the SLS program would not be charged to a commercial partner. If a commercial user required any additional development/modification costs to meet specific launch requirements of the commercial user, it would be responsible for reimbursing those costs to NASA.

Pad B modification in support of SLS launch is planned to be completed in 2017, based on the FY 2014 enacted budget.

Questions from Congressman Kennedy

1. **As you highlighted in your written and verbal testimony, because many of NASA's facilities need significant upgrades, I am seeking clarification on where the funds to upgrade these facilities come from. If NASA is leasing or selling a property to a specific entity, will that entity pay for any upgrades? When a site is expected to be multi-user and shared by NASA, do the taxpayers solely pay for any required upgrades, or is there shared contribution by the entities that will be using the facility?**

Response: Renovation, construction or other upgrades of NASA facilities that are utilized by the Agency in support of Agency missions and programs are funded by NASA appropriations. In the case of underutilized NASA facilities, for which NASA has entered into some form of out-grant agreement with a single entity, any required upgrades or modifications that the grantee wishes to make to suit the purposes of their use are financially the responsibility of that user. NASA does not fund any such activities. For NASA facilities that are intended to have multiple tenants and are shared by NASA, NASA has made selected investments for capabilities that would benefit NASA and potentially other users. Costs for any upgrades and modifications that would benefit a specific user are borne solely by that entity.

2. **Many of NASA's facilities are national assets that took significant taxpayer investment to construct. They are unique and matched by no other facilities in the world. How will you ensure that the process to transfer or share these facilities is fair and open?**

Response: When NASA determines that property is excess to its needs, NASA will continue to follow the disposition process spelled out in the Federal Property and Administrative Services Act Of 1949, as amended (40 U.S.C. 524).

To ensure the transfer or sharing of underutilized national assets is fair and open, NASA advertises available assets to third parties by posting Notices of Availabilities, Request for Proposals, Announcement for Proposals in public announcement sources such as Fed Biz Opps and local and national papers. Each advertisement openly documents the available assets, any requirements and the selection criteria for making the selection of a future user of an underutilized asset. Tendered offers by third parties in response to these advertisements are evaluated through processes similar in nature to a federal procurement evaluation process. Offers are evaluated to determine the proposal that offers the best value to the Government.

3. **Private, public, and academic sector partners have always been, and will continue to be, vital to the success of NASA. As you evaluated your current facilities and future plans, are you working with universities and companies to either transfer or share these facilities? If so, could you describe that process?**

Response: NASA partners with external parties worldwide in the conduct of its work and in the stewardship of needed capabilities. NASA has many avenues for working with current and potential partners to make its facilities available when not fully or continuously utilized. The Space Act, for example, offers NASA considerable latitude to enter into partnerships that advance its mission objectives. By seeking out compatible external parties who can share use of capabilities NASA needs but does not always fully utilize, operating and sustaining costs of such

capabilities are spread beyond NASA alone, enabling the Agency to stretch its funding to accomplish more.

When facilities are no longer required for NASA's use, they are disposed according to the various authorities available to NASA. Excess property is disposed through the General Services Administration (GSA) disposal process or demolished under delegated demolition authority from GSA. Underutilized facilities are dispositioned depending on their future mission requirements and their appropriateness for utilization by others. Oversight of disposal or out-granting of NASA's facilities is provided by the Office of Strategic Infrastructure, Mission Support Directorate in accordance with NASA Policy Directive 8800. NASA has a range of authorities available to out-grant underutilized facilities. The selection of the authority to use to make facilities available to third parties is made on a case-by-case basis, depending on the facility, its function and location. Processes and procedural guidance are in place for pursuing each of the various out-granting mechanisms. More recently, NASA has initiated process improvement studies to evaluate its processes for out-granting NASA facilities to commercial industry.

Questions from Congressman Stockman:

1. In your testimony, Congressman Ralph Hall asked you “if the Ames arc jet would be capable of fulfilling all of NASA requirements?” You answered, “Yes, after transition is complete.”
 - a. Which requirements are being met with the transition...1) the initial requirements conveyed several years ago as critical to flight certification and broad TPS testing with a full range of capabilities, all of which NASA HQ and ARC stated would be transitioned and capabilities met? **OR** 2) the “post-awareness requirements” when NASA HQ became aware of their inability to meet the original requirements for the full range of TPS testing?
 - b. You indicated that you had not seen the March 8, 2012, S&MA briefing which detailed the comparisons of capability, safety, reliability, mission assurance and flight certification risks, program requirements, costs, etc.
 - i. Have you had the opportunity to review this briefing?
 - ii. Given the background noted above, do you have any concerns with continuing with this transition?
 - iii. Given the transition issues, delays and costs that have occurred in just this past year with the initial equipment being transferred, do you believe this to be a prudent decision for NASA?

Response:

- a. The Arc heater hardware from JSC has been successfully installed at ARC and is undergoing testing to evaluate its performance against requirements that have been established through extensive technical review among TPS material and facility experts representing JSC Engineering, ARC facility operations, Orion thermal protection shield (TPS), and JSC Safety and Mission Assurance (S&MA). Progress against requirements has been excellent; as of mid-November 2013, the evaluation is approximately 85 percent complete.
- b. i. The presentation entitled “Agency/MPCV Risk: Inability to Certify TPS Performance” was a pre-decisional document prepared for presentation to the JSC Safety and Mission Assurance Technical Review (STR) Board, an internal discussion forum established to inform leaders of the JSC S&MA Directorate about changing conditions that might warrant development of a formal dissenting opinion to the original Agency Mission Support Council arc jet decision. This internal vetting is consistent with Agency policy; review by the JSC STR Board is an element of the first step in NASA’s dissenting opinion process to establish the facts of the case. Based on the March 8, 2012 review of the STR Board, the JSC S&MA Directorate recommended, with unanimous concurrence of the board membership, that NASA maintain the capability to conduct arc jet testing required to support the Orion Program. The recommendation further stated that, with the planned closure of the JSC arc jet facility and transfer of one heater string to ARC, NASA should ensure that the planned upgrade to the ARC arc jet facility retains the capability required to support Orion testing, as well as maintain availability of the remaining JSC heater string until the ARC transition is complete, if required to support Orion testing.

ii. The issues in the S&MA document have been extensively reviewed by appropriate technical and program experts. The technical issues have been specifically addressed during a multi-part review process initiated by the NASA Chief Engineer and conducted by TPS material and facility experts representing JSC Engineering, ARC facility operations, Orion's TPS, NASA Engineering and Safety Center, and JSC S&MA.

The Agency has made resources available for arc jet transition to address all of the technical issues raised by the S&MA concerns and resulting requirements definition. The Agency's subject matter experts have established criteria for both a successful arc jet transition and a certification pathway for the Orion heat shield. For risk mitigation, the JSC arc jet facility is remaining operational until these criteria are met. All indications to date are that the transition project is meeting its requirements fully.

iii. NASA has assessed its arc jet consolidation strategy as the most cost effective means for maintaining present and future thermal protection test capability. Installing the JSC arc heater hardware at ARC assures that its technical capabilities are retained into the future, in an infrastructure that is more than sufficient to sustain its operations. It would not be possible to install and operate the ARC hardware in the JSC arc jet infrastructure without making cost-prohibitive modifications to the JSC vacuum, electrical, gas handling, and cooling systems, and associated horizontal infrastructure. In addition, by concentrating test assets at ARC, the Agency's limited infrastructure recapitalization funds can be focused on increasing the reliability of a single test infrastructure. This will improve the reliability of NASA's thermal protection test capability and assure that a robust test capability is available for ongoing and future NASA mission requirements.

Appendix II

ADDITIONAL MATERIAL FOR THE RECORD

SUBMITTED STATEMENT OF DONNA F. EDWARDS, RANKING MEMBER, SUBCOMMITTEE
ON SPACE, COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY

Thank you, Mr. Chairman, for holding today's hearing to review NASA's infrastructure and facilities, and I would like to welcome our witnesses.

Before I start, allow me to congratulate NASA, the Ames Research Center, the Wallops Launch Facility, agency employees, contractors, the Mid-Atlantic Regional Spaceport, and Orbital Sciences in particular, for two outstanding space launches in the past two weeks. I am hopeful that LADEE will give us further insight into the Moon's environment and that Orbital's docking of its Cygnus spacecraft to the International Space Station signals the start of routine cargo resupply to that orbital laboratory.

NASA, like other government agencies, built a range of facilities during its early years to meet national objectives. In NASA's case, those objectives included sending probes to investigate the Earth-space environment and study near and distant planets, advancing aeronautics, and sending humans to the surface of the Moon and returning them home safely. The Space Shuttle, during its thirty years of operations, required its own considerable infrastructure.

These facilities, and many others at NASA, have enabled the United States to achieve the remarkable discoveries and advances over the last 50 years that have inspired generations of Americans.

The problem, as we know, is that the assets that enabled the past, are now, to an extent, a burden on the future. Nearly 80 percent of NASA's facilities are more than 40 years old. In addition, NASA is carrying a deferred maintenance backlog assessed at more than \$2 billion.

It is hard to expect NASA to perform as a 21st century space agency with 20th century facilities. In fact, a 2010 National Academies report, *Capabilities for the Future: An Assessment of NASA Laboratories for Basic Research*, found that:

“Over the past five years or more there has been a steady and significant decrease in NASA's laboratory capabilities, including equipment, maintenance, and facility upgrades. The fundamental research community at NASA has been severely impacted by the budget reductions that are responsible for this decrease in laboratory capabilities, and as a result NASA's ability to support even NASA's future goals is in serious jeopardy.”

And yet, research laboratories are just one facet of the problem. There are test stands, wind tunnels, arc jets, thermal vacuum chambers, launch complexes, and Shuttle processing facilities that are underutilized or that may no longer have a defined NASA need.

NASA Authorization Acts of 2005, 2008, and 2010 have provided direction to NASA to address its infrastructure challenges, and multiple reports of the NASA Inspector General, among other advisory bodies, have highlighted NASA's infrastructure challenges.

To its credit, NASA has, and is, taking positive steps to facilitate prudent, strategic decisions on maintenance, consolidation, demolition, and renewal of facilities, including the development of an Agency Facilities Strategy and an integrated agency-wide Real Property Master Plan.

But let's face it, NASA's facility and infrastructure challenges are a bit of a Catch-22. NASA needs clear direction on its future, especially in human spaceflight and exploration, to help the agency leverage and optimize its infrastructure decisions and investments.

And the underutilization of assets, along with the poor state of NASA's research labs, is in part a result of not giving NASA the resources it needs to implement the missions the nation is asking it to carry out.

So, we have a choice: ignore the problem and let NASA's facilities run themselves into the ground to the point at which NASA is limping into mediocrity.

Or invest in NASA and enable its future as a 21st century space agency that will continue its remarkable successes while fostering our national innovation agenda, the passions and dreams of our people, and new discoveries and advances in science, aeronautics, human spaceflight and exploration.

I submit that this is not the time to back away from NASA. Rather, this is the time to provide NASA with the tools it needs to become a productive 21st century space agency.

That's why I included in my alternative NASA Authorization Act of 2013 bill, H.R. 2616, provisions to both focus NASA on an exploration goal and to help address NASA's aging facilities.

I know there are a lot of issues to discuss and I look forward to hearing from our witnesses on today's topic, for which I believe the hearing title couldn't be more

apt—"NASA INFRASTRUCTURE: ENABLING DISCOVERY AND ENSURING CAPABILITY."
Thank you, and I yield back.

SUBMITTED STATEMENT OF EDDIE BERNICE JOHNSON, RANKING MEMBER, COMMITTEE
ON SCIENCE, SPACE, AND TECHNOLOGY

Good morning. I would like to join my colleagues in welcoming our witnesses to today's hearing.

When we think of NASA, we think of astronauts at work on the International Space Station, the Apollo program and today's Orion and Space Launch System exploration vehicles. We think of cutting edge aeronautics research; robotic spacecraft landing on Mars, heading to the far reaches of the solar system and beyond, and imaging distant galaxies; as well as of spacecraft circling the Earth to provide us with unforgettably imagery and critical data needed to better understand our home planet and its climate. When we think of NASA, we don't often think of wind tunnels, environmental test chambers, research labs, and office buildings. However, NASA's impressive accomplishments would not be possible without NASA's infrastructure and NASA's dedicated workforce.

That is why today's hearing is so important. We must ensure that NASA has the facilities and equipment that it needs to remain preeminent in space exploration, science, and aeronautics in the coming decades, and this hearing will help provide Members with the information we will need as we make decisions on NASA's funding and priorities. In that regard, I hope that today's hearing will be followed in the future by a hearing to look at what can be done to ensure that NASA's employees will remain productive and at the forefront of their fields too, especially at a time when the federal workforce is facing severe challenges on a number of fronts.

Mr. Chairman, as we debate the fiscal challenges we face as a nation, it is important that we not let our examination of NASA's infrastructure turn into simply an accounting exercise, one focused on cost savings and budgets cuts. By that I don't mean to minimize the importance of seeking efficiencies and appropriate cost savings in NASA's infrastructure investments whenever possible. Rather, what I am saying is that we need to focus first on what we are trying to accomplish with the nation's investments in NASA-what are the outcomes we are seeking. Only then, can we intelligently assess what NASA will need in the way of infrastructure now and in the future. I believe that the NASA Authorization bill that Rep. Edwards and I introduced earlier this year provides clear direction and compelling goals for the agency, and I want to continue to work with colleagues on both sides of the aisle to come to a bipartisan consensus on NASA this year. However, I think it should be clear to all of us that NASA will be unable to achieve those goals if we fail to invest in safe, efficient, and productive infrastructure for the agency.



Agency/MPCV Risk: Inability to Certify TPS Performance

Dr. Maria V. Pulsonetti
NASA S&MA SSE for TPS/Aerosciences/CSM

Presented to STR Board
March 8, 2012
(Including STR Board Recommendations)

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Summary

Agency Strategy

- Agency plan is to move the JSC TP1 arc heater to ARC immediately and close the JSC arcjet facility by 10/1/12
- Agency has identified 5 unique capabilities of the JSC arcjet. Agency plan calls for ARC to demonstrate 3 of the 5 JSC arcjet capabilities
- It is TPS S&MA's recommendation that the JSC arcjet should not be closed and any potential closure planning should begin after all 5 of the JSC arcjet capabilities are demonstrated at ARC as well as LIF demonstration

MPCV Program

- MPCV programs plan for certifying the TPS for EM1/EM2 is TBD
- Even if ARC is successful at demonstrating 3 of the 5 capabilities of the JSC arcjet, the MPCV program will lose the capability to test large models, including large wedges at angles of attack, and to obtain LIF data of the flowfield.
- Low pressure/low heat flux test capability is critical for TPS certification. ARC is planning to provide, however, S&MA hasn't seen a plan for how ARC will accomplish this capability
- We believe the capability loss will severely impact our ability to certify the TPS for EM1/EM2.
- Like most things, the devil is in the details



Summary

Current Status				Status if ARC gets JSC Archeater Running			
Test Type	JSC	ARC	Both	Test Type	JSC	ARC	Both
Low Pressure, Low Heat Flux	X			Low Pressure, Low Heat Flux	X		
High Pressure, Low Heat Flux	X			High Pressure, Low Heat Flux		→	X
Med. Range Pressure, Med. Range Heat Flux			X	Med. Range Pressure, Med. Range Heat Flux			X
Low Pressure, High Heat Flux			X	Low Pressure, High Heat Flux			X
High Pressure, High Heat Flux		X		High Pressure, High Heat Flux		X	
Profile Testing	X			Profile Testing		→	X*
Larger Diameter Models	X			Larger Diameter Models	X		
Smaller Diameter Models			X	Smaller Diameter Models			X
Large Wedges at High Angles of Attack	X			Large Wedges at High Angles of Attack	X		
LIF	X			LIF	X		
90% CO2 Test gas	X			90% CO2 Test gas	X		

* Profile Testing will not be able to hit the low pressure, low heat flux condition

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NASA's Current Plan



Test Capabilities to Retain at ARC

- Five unique test capabilities at JSC:

1. Flexible test gas mixtures of **oxygen/nitrogen** ranging from 0/100 O_2/N_2 to 30/70 O_2/N_2 (by mass) in continuously variable ratios
2. Simulating **flight-profile variations** of heat flux to a material test sample to follow the time-varying surface conditions as closely as possible from a wide range of flight trajectories of the Orion (and other) spacecraft
3. Testing on heat shield material samples at **low level** stagnation point heat flux and stagnation pressure, in the range of 10 to 20 W/cm^2 (cold-wall heat flux) and 0.5 to 2 kPa absolute pressure

Partially Funded
(Phase 1)

Unfunded
(Phase 2)

4. Flexible test gas mixtures of **carbon dioxide/nitrogen** with ratios ranging from 0/100 to 90/10 CO_2/N_2 (by mass) in continuously variable ratios

Unfunded
No Plans to Attempt

5. Stagnation test bodies (70-degree sphere-cone shape) as **large as 68.5 cm** (27 inches) in **diameter** are immersed in the plasma test stream at any stagnation heating and pressure condition



ARC estimated Phase 1 to take 18-24 months to complete, HQ decided it will be done by 10/1/12

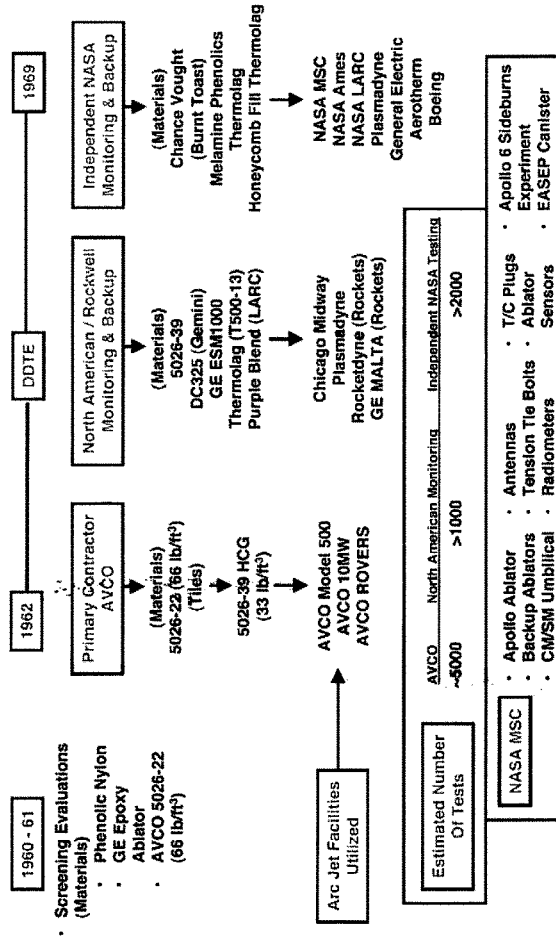
From SRR package 2/29/12

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Apollo TPS Testing

Apollo performed 8000 arcjet tests on TPS and tested in ~20 arcjet facilities





Reduced Testing Capability – Test Conditions Not Achievable

Test Conditions Achievable

- ARC has a smaller diffuser and a smaller chamber and therefore may not be able to reach the lower pressures that the JSC arcjet can reach with the same heater (JSC diffuser 48% larger area than ARC diffuser, JSC test chamber 77% greater area than ARC test chamber)
- ARC arcjets currently can not reach the same low pressures reachable by the JSC arcjets
- The low heat flux, low pressure condition is where we have the highest uncertainty in the avcoat performance

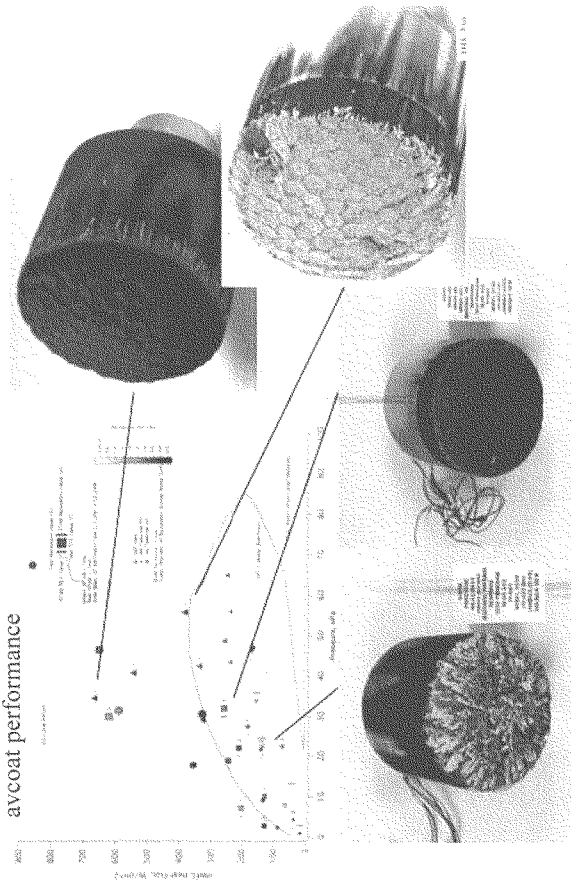


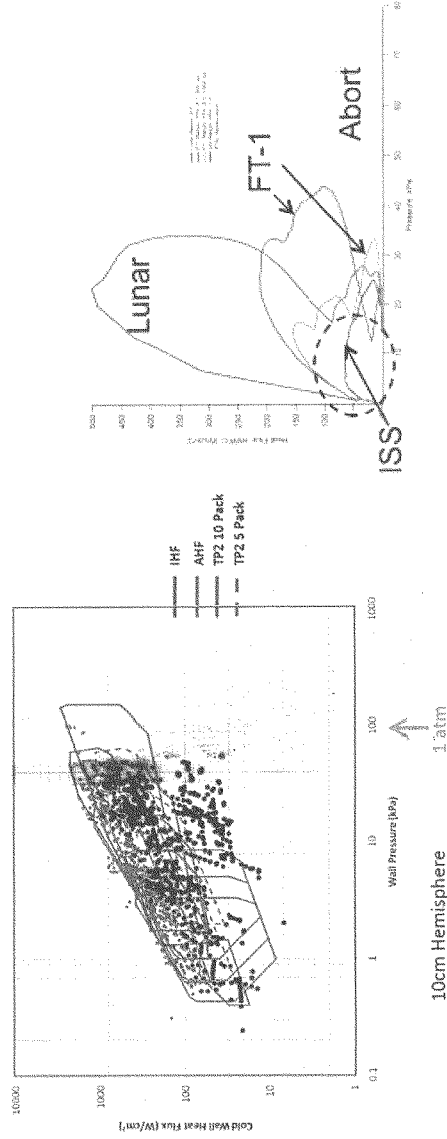
PHOTO: V. L. LUNDGREN@NASA.GOV



Need Low Pressure, Low Heat Flux Testing

- For all trajectories, TPS is subjected to low pressure, low heat flux conditions
- For skip trajectories, such as that to be used for EM1/EM2, TPS is subjected to these conditions 3 times
- Arcjet testing at low pressure and low heat flux required to certify TPS

Without the low pressure, low heat flux capabilities, even if ARC get the TPI heater working and can perform profile testing, they will not be able to test the full profile (missing low pressure, low heat flux)



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Reduced Testing Capability – Model Size, LIF

- Model Size Limitation
 - Due to smaller diffuser and chamber size, the JSC arc heater attached to the ARC equipment will not be able to test the same size models (Flow Blockage Issue)
 - MPCV TPS System Level Testing
 - MPCV Compression Pad Assembly
 - MPCV Cork, VAMAC, and FRSI testing
 - X-33 WLE Testing
 - IRVE Testing
- Lack of Laser Flow Diagnostics
 - Laser techniques for flow diagnostics are critical for assessing TSP performance due to uncertainty in the arcjet flowfield
 - ARC has no current flowfield laser diagnostic capability in their arcjets
 - JSC arcjet has LIF (Laser Induced Floresence) capability and is available with each test
 - Most customers, including MPCV, request LIF data with arcjet tests



Reduced Testing Capacity

- The closure of the JSC arcjet leads to approximately a 50% reduction in testing capacity.
- MPCV program will require significantly more TPS testing for manned missions than what was required for EFT-1. According to the current testing estimates for EM1/EM2, it appears that ARC can handle the testing capacity, however, that assumes that there are no unexpected facility down time and the facility is dedicated to Orion testing
- CC development will also begin to require more TPS testing in the coming years for development of their vehicles
- Any unplanned downtime due to maintenance, equipment failures, or natural disasters will lead to no TPS testing capability for the Agency during the downtime (Single point failure on TPS testing)
- Even with the effort to investigate the cost of moving the JSC arc heater to ARC, there are significant schedule impact to the TPS testing and potentially to the launch date of EFT-1

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9



Increased Testing Cost/Reduced Scope

- Increased run cost at ARC
 - Even with the \$9M SCAP funding ARC arcjet get from HQ every year, the cost/day in the ARC arcjet facility is 65% greater than at the JSC arcjet facility. Without the SCAP funding the cost per day at ARC would be greater than 4 times that at JSC. (cost per day: JSC \$20K, ARC with SCAP \$33K, ARC without SCAP \$84K)
 - Major arcjet test customers have decided to test at JSC as ARC is more expensive: MPCV, Boeing (CCDev), OCT Projects
 - With the limited MPCV budget, switching tests from JSC to ARC amounts to less TPS testing, reduced understanding of TPS performance, and a corresponding increase in risk of the TPS.

128



Additional Issues (EFT-1 Specific)

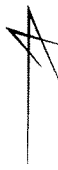

The effects of the plan to move the JSC arc heater to ARC is already having an technical and schedule impact

- Due to the planning for the shipment of the JSC arc heater to ARC, there is a risk that key arcjet testing will not be performed in time to support the design, verification, validation, and qualification of EFT-1 TPS:
 - Potential for inability to perform the 11 scheduled arcjet test series this FY
 - Avcoat, carbon phenolic, cork, vamac, FRSI spot checks, validation tests, qualification tests
 - Avcoat seams tests, avcoat ground repair tests, heat shield DFI radiometer development tests
 - Potential for inability to perform the 10 scheduled radiant facility test series this FY
 - LAS pads, hatch/service panel, LAS bumper pads, LAS well, passive vents, yaw thrusters, star tracker, window, side hatch handle
- Reduced scope for testing moved to ARC



More Impacts to EFT-1

Chart from LM TPS Thermal Designer Lead for MPCV (3/5/12)

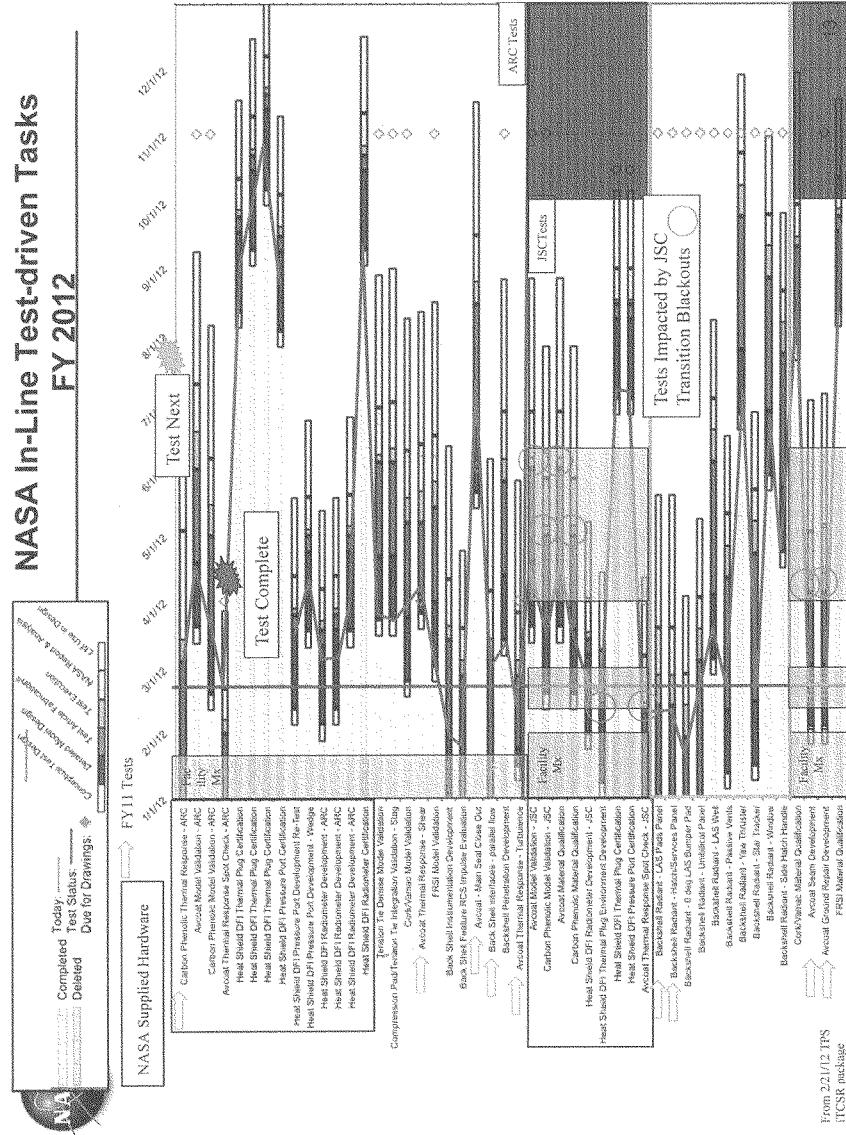


Technical Issues

Crew Exploration Vehicle

- Cracked Avcoat
 - Possible arcjet testing to evaluate survivability
 - Preliminary discussions to plan test article design, materials availability, method for "cracking" Avcoat, etc.
- JSC Arcjet shutting down?
 - Schedule impact to currently planned arcjet testing is expected
 - May affect 10-11 arcjet test programs AND may delay Radiant testing too

4





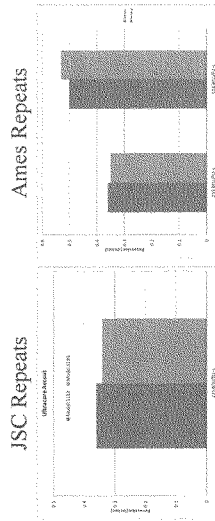
Increased Facility Driven Uncertainty

- Arcjet testing is a simulation of reentry environments and inherently has large uncertainties.
- Today's approach is to obtain test data from different facilities with different test approaches and different test hardware to verify TPS performance.
- This independent verification is essential, and is the charter of S&MA (independent assessment of the work of our engineering counterparts).
- Shutting down the JSC arcjet will result in the loss of the ability to verify the validity of test data.
- Multiple examples of discrepancies in test data between the two facilities are available:
 - RCC mass loss issue in 2001
 - Current avcoat data discrepancies between the two arcjet facilities for MPCV

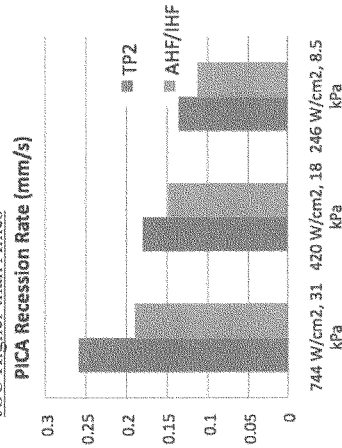


Facility-to-Facility Uncertainty

Avcoat Recession Data Repeat
Well within a Facility



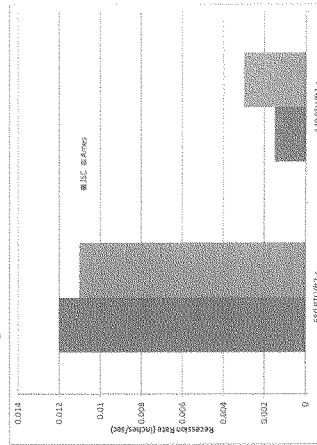
~28% Avg. Recession Difference for PICA
JSC Higher than Ames



Ablators Tested in Both Facilities at Similar Conditions Indicate a Significant Uncertainty in Recessions – due to Unknown Facility Differences – Present Mitigation is to Test in Both Facilities and Include Differences in Recession Margin

25% Additional Recession Margin
Results in ~+200 lbs Avcoat for Lunar

~50% Avg. Recession Difference for Avcoat



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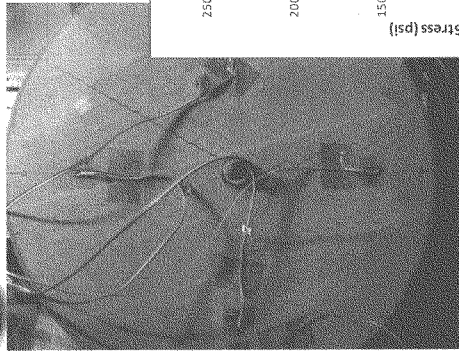
Additional Issues

Closure of the JSC arcjet on 10/1/12 is NOT contingent on the success of the ARC to reproduce the JSC arcjets capabilities using the JSC arc heater.

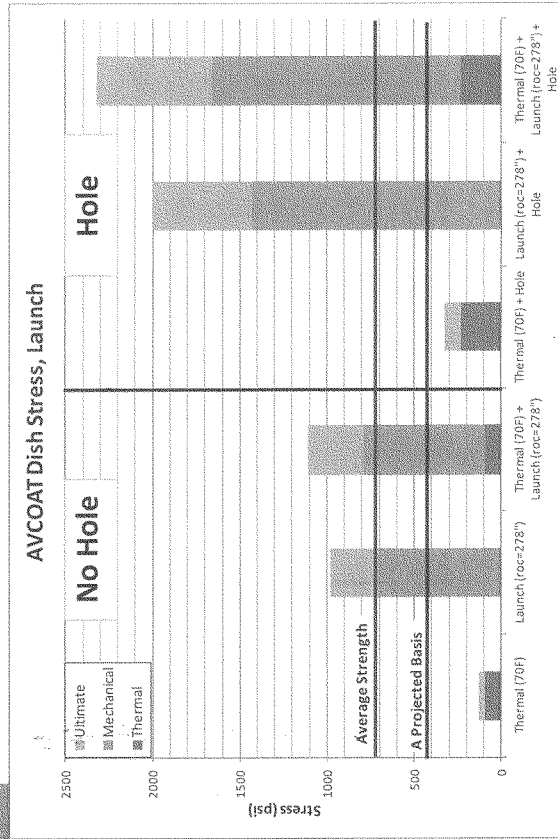
- Risk of loss of arcjet profile testing
 - If ARC can not bring the JSC equipment online and within the proposed schedule (fall 2012) there will be program impacts (technical/cost/schedule) to MPCV program
 - Current critical risk issue for EFT-1 is avcoat cracking
 - Need profile testing to determine what degree of avcoat cracking is allowable for entry
 - Only facility with that capability is the JSC arcjet
 - Future space transportation missions would also require profile testing of TPS
 - Key to understanding the performance of ablators
 - Ablating TPS is required for entry speeds above LEO
 - Will need to perform a large number of profile tests to rate TPS for a manned vehicle beyond LEO (including EM1/EM2 for MPCV program)



Proposed Top Program Risk – Avcoat Cracking



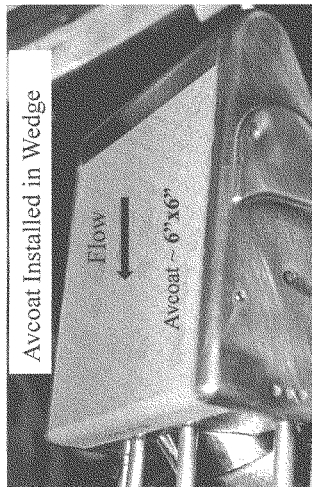
LM Stress Expecting Avcoat to Crack at Launch



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Avcoat Cracking – Proposed Arcjet Test Plan



Source of Test Articles

- CTE Test Article (thermally induced cracks)
- Mechanically induced cracks
- Machined cracks

Test Objectives

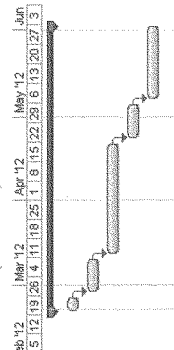
- Obtain data to determine the change in bondline temperature due to cracked Avcoat;
- Obtain data to evaluate the potential for local recession

Proposed Test Matrix

- Test Article Parameters
 - Two Crack Widths
 - Two Crack configurations
 - + Flow orientation
 - + Avcoat thickness
 - + Avcoat End State
- Test Conditions
 - Three conditions
 - + Two steady state
 - + One flight profile (must be done at JSC)

- 12 test articles + 3 baseline (no crack)

Task Name	redecessor	Duration	Start	Finish
1 Cracked Avcoat Arc Jet Testing		75 days ?	Mon 2/28/12	Fri 6/1/12
2 Define crack geometry (stress inputs)		5 days	Mon 2/20/12	Fri 2/24/12
3 Design Arc Jet Models		10 days	Mon 2/27/12	Fri 3/9/12
4 Fabricate Arc Jet Models		30 days?	Mon 3/12/12	Fri 4/20/12
5 Arc Jet Testing		10 days	Mon 4/23/12	Fri 5/4/12
6 Post Arc Jet Thermal Analysis		20 days?	Mon 5/7/12	Fri 6/1/12



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More Impacts of Loss of JSC Arcjet outside MPCV Concerns

- Lack of Variable Test Gases
 - JSC arcjet facility has demonstrated the ability to test flexible mixtures of test gases
 - Mars test gas simulations performed with 90% CO₂/ 10% N₂
 - Studies performed to prove the risk of explosion for CO was not an issue, that CN would not be formed, and that there were no environmental impacts with running CO₂/N₂ mixtures
 - ARC facility would need to go perform the same studies to ensure they could safely perform CO₂/N₂ testing
 - Due to the large vacuum sphere at ARC, the buildup of CO and CN could be a significant issue preventing them from being able to test CO₂/N₂ gas mixtures



Additional Observations

- The loss of the JSC arcjet capabilities would severely impact:
 - The current program (MPCV)
 - The CC DEV program
 - Future lunar programs
 - Future planetary programs
- TPS is always a key driver in the LOC/LOM PRA analyses for any vehicle. This is also true to MPCV EFT-1 LOV numbers. The loss of the JSC arcjet and its capabilities would drive up LOC/LOM/LOV numbers due to the increased risk of TPS failure.
- The current HEOMD requirement for earth entry velocity states “*The MPCV shall provide a direct Earth entry capability for 11500 meters per second (m/s) (37730 feet per second) or greater.*” This can only be achieved by ablative TPS. Ablative TPS would require profile testing in conditions only achievable at the JSC arcjet facility.
- With the planned closure of the JSC arcjet facility there will be a number of impacts to TPS leading to a higher risk for TPS to thermally protect the structure and potentially the inability to certify TPS for a manned mission.



Risk Qualification Levels

			2	
			1, 3	
			4	

Score: 3x5

- ☐ 1. TPS failure to thermally protect structure for EM2 (current risk: JSC arcjet open, no LEAF)
- ☐ 2. TPS failure to thermally protect structure for EM2 (JSC arcjet closed, no LEAF)
- ☐ 3. TPS failure to thermally protect structure for EM2 (JSC arcjet closed, LEAF completed)
- ☐ 4. TPS failure to thermally protect structure for EM2 (JSC arcjet open, LEAF completed)

139

	Likelihood Description
5 Very High	Qualitative: Nearly certain to occur. Controls have little or no effect. Quantitative: 10^{-1} - 10^{-2} (for risks with primary consequence on Human Safety - "Personnel") or $P \geq 50\%$ (for risks with primary consequence on Cost, Schedule, or Performance).
4 High	Qualitative: Highly likely to occur. Controls have significant uncertainties. Quantitative: 10^{-2} - 10^{-3} (for risks with primary consequence on Human Safety - "Personnel") or $33\% \leq P \leq 50\%$ (for risks with primary consequence on Cost, Schedule, or Performance).
3 Moderate	Qualitative: May occur. Controls exist with some uncertainties. Quantitative: 10^{-3} - 10^{-4} (for risks with primary consequence on Human Safety - "Personnel") or $10\% \leq P \leq 33\%$ (for risks with primary consequence on Cost, Schedule, or Performance).
2 Low	Qualitative: Not likely to occur. Controls have minor limitations/uncertainties. Quantitative: 10^{-4} - 10^{-5} (for risks with primary consequence on Human Safety - "Personnel") or $1\% \leq P \leq 10\%$ (for risks with primary consequence on Cost, Schedule, or Performance).
1 Very Low	Qualitative: Very unlikely to occur. Strong Controls in Place. Quantitative: $P \leq 10^{-5}$ (for risks with primary consequence on Human Safety - "Personnel") or $P \leq 1\%$ (for risks with primary consequence on Cost, Schedule, or Performance).

Saf - Safety			
▲ - Top Directorate Risk (TDR)			
△ - Proposed Top Directorate Risk (P-TDR)			
■ - Top Program Risk (TPR)			
□ - Proposed Top Program Risk (P-TPR)			
◆ - Top Project Risk (TProjR)			
◇ - Proposed Top Project Risk (P-TProjR)			
▼ - Top Sub-org Risk (TSR)			
▽ - Proposed Top Sub-org Risk (P-TSR)			
Low			

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21



TPS S&MA Recommendation

- The agency needs to come up with a plan to maintain the test capability, test capacity, and the independent verification we currently have to assess TPS performance
- TPS S&MA's recommendation is to have the JSC facility remain open to ensure the complementary test capabilities to the ARC facility (capabilities needed to certify TPS), to ensure test capacity, ensure maximum testing scope, and minimize the facility driven uncertainties.
- The closure of any TPS testing facility, at a minimum, needs to be contingent on the demonstration of those capabilities existing in another facility without impacts to the current facility(s)
 - For the JSC arcjet closure, the closure should be contingent on ARC successfully demonstrating all of the 5 unique capabilities of the JSC arcjet facility (shown below) as well as demonstrating a LIF capability
 - Ability for separate N₂ and O₂ test gases injection in the heater
 - Replication of JSC arcjet test conditions (including low pressure (0.5 KPa)/low heat flux (10 W/cm²) and low heat flux/high pressure)
 - Profile testing capabilities consistent with JSC arcjet
 - Ability to test large models consistent with what could be tested at JSC arcjet facility
 - Ability to run with a 90%CO₂/10% N₂ test gas injected into arc heater and replicate JSC test data



STR Board Recommendations (3/8/12)

- The agency should preserve current arcjet capabilities
 - Keep both facilities (JSC and ARC) open or make ARC more capable than proposed in current plan
 - If plan is to make ARC more capable, ensure that JSC is left open until ARC has successfully demonstrated the full range of capabilities of the JSC arcjet facility
- Action: John Trainor: Tag up with Scott Johnson to determine Commercial Crew position on the proposed JSC arcjet closure and the associated impacts



BACKUP

142

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24



NASA Risk: Summary Report

Open Date: 03/?/12 ECD: TBD

Risk Title: Inability to certify TPS performance	Owning Organization:		
Escalation Level:	Risk Owner:		
Risk Statement: With the planned closure of the JSC arcjet facility there will be a number of impacts to TPS leading to a higher risk for TPS to thermally protect the structure and potentially the inability to certify TPS for a manned mission.			
Impact Consequence: Increased Risk for TPS failure to thermally protect the structure and potentially the inability to certify the TPS for a manned mission. Factors leading to this include: <ul style="list-style-type: none">• Reduced Testing Capability – Technical Risk<ul style="list-style-type: none">- Agency will lose capability to test TPS at critical test conditions (low pressure, larger model sizes, etc.).• Reduced Testing Capacity – Schedule and Technical Risk<ul style="list-style-type: none">- All Agency and commercial arc-jet testing will need to be funneled through one test facility. 50% reduction in capacity. Also, if facility goes down for maintenance or due to equipment failures or natural disasters, the Agency will have no test capability for the down time.• Increased Testing Costs/Reduced Scope – Cost and Technical Risk<ul style="list-style-type: none">- Arc-jet testing at JSC costs considerably less than that at Ames (65% greater with ARC SCAP funding, 420% greater without SCAP funding)• Increased Facility Driven Uncertainty– Technical Risk<ul style="list-style-type: none">- Arc-jet testing has inherently large uncertainties and there will no ability to verify the data obtained. Avcoat has been showing a 50% difference in recession between the JSC and ARC facilities at the same conditions. Need independent verification to ensure understanding of TPS performance. Reference Points: TPS is the number two risk for the MPCV. TPS is one of the key technology development items in the NASA Technology Roadmap as defined by the National Research Council.			
Likelihood: 4	Sched: 4	Cost: 4	TECH: 5
Status:			

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NASA Risk: Summary Report

Open Date: 03/2/12 ECD: TBD

Mitigation Summary

Risk Title: Inability to certify TPS performance

Mitigation Plan:

1. JSC arcjet remains open. (TPS failure for EM2 estimated at 3x5 without LEAF, and 2x5 with LEAF complete)
2. Ensure that NASA maintains the 5 of the JSC arcjet capabilities and the JSC facility is not closed until these capabilities are demonstrated. This plan still has significant limitations in that it does not address the test capacity, independent verification, or increased cost/reduced scope issues which increases risk for the ability to assess TPS performance. Increased risk of TPS failure for EM2 relative to mitigation plan number 1.
3. NASA's present plan is to establish some (3 of 5) of JSC test capabilities at ARC. This mitigation plan, if successful, addresses only some of the technical risks and further does not address the test capacity, independent assessment, or increased cost/reduced scope issue. Increased risk of TPS failure in comparison to mitigation plan number 1 or 2. (TPS failure for EM2 estimated at 4x5)

Fallback Plan:

Task No.	Task Description	Actionee	ECD	ACD	Resulting L x C	Success Criteria

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MPCV Likelihood Criteria

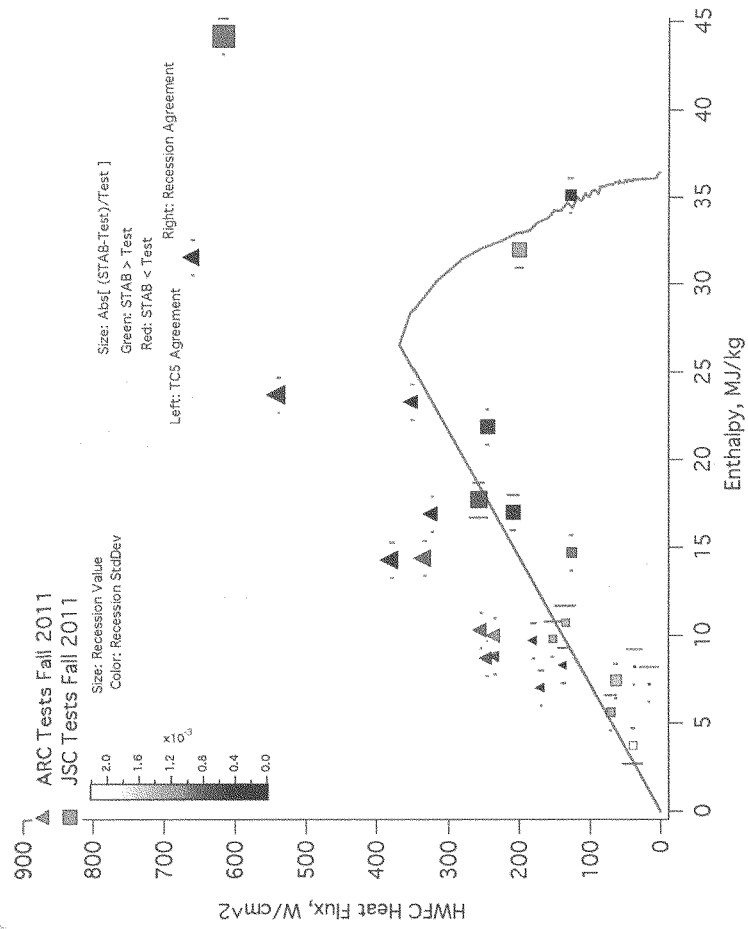
	Likelihood Description
5 Very High	<p>Qualitative: Nearly certain to occur. Controls have little or no effect.</p> <p>Quantitative: $10^{-1} < P$ (for risks with primary consequence on Human Safety - "Personnel") or $P > 50\%$ (for risks with primary consequence on Cost, Schedule, or Performance).</p>
4 High	<p>Qualitative: Highly likely to occur. Controls have significant uncertainties.</p> <p>Quantitative: $10^{-2} < P \leq 10^{-1}$ (for risks with primary consequence on Human Safety - "Personnel") or $33\% < P \leq 50\%$ (for risks with primary consequence on Cost, Schedule, or Performance).</p>
3 Moderate	<p>Qualitative: May occur. Controls exist with some uncertainties.</p> <p>Quantitative: $10^{-3} < P \leq 10^{-2}$ (for risks with primary consequence on Human Safety - "Personnel") or $10\% < P \leq 33\%$ (for risks with primary consequence on Cost, Schedule, or Performance).</p>
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1 Very Low	<p>Qualitative: Very unlikely to occur. Strong Controls in Place.</p> <p>Quantitative: $P \leq 10^{-4}$ (for risks with primary consequence on Human Safety - "Personnel") or $P \leq 1\%$ (for risks with primary consequence on Cost, Schedule, or Performance).</p>

From CxP 72091 Rev C : "Orion MPCV Integrated Risk Management Plan"

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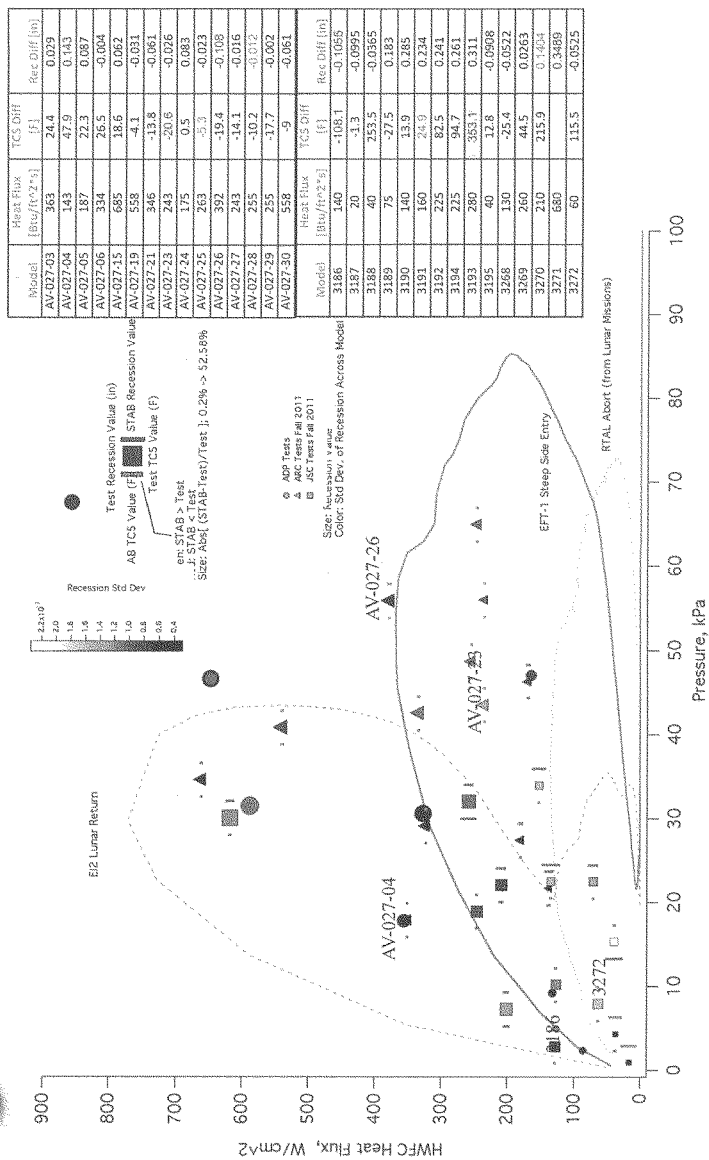


Avcoat Arcjet Test Environments and Expected Flight Environments

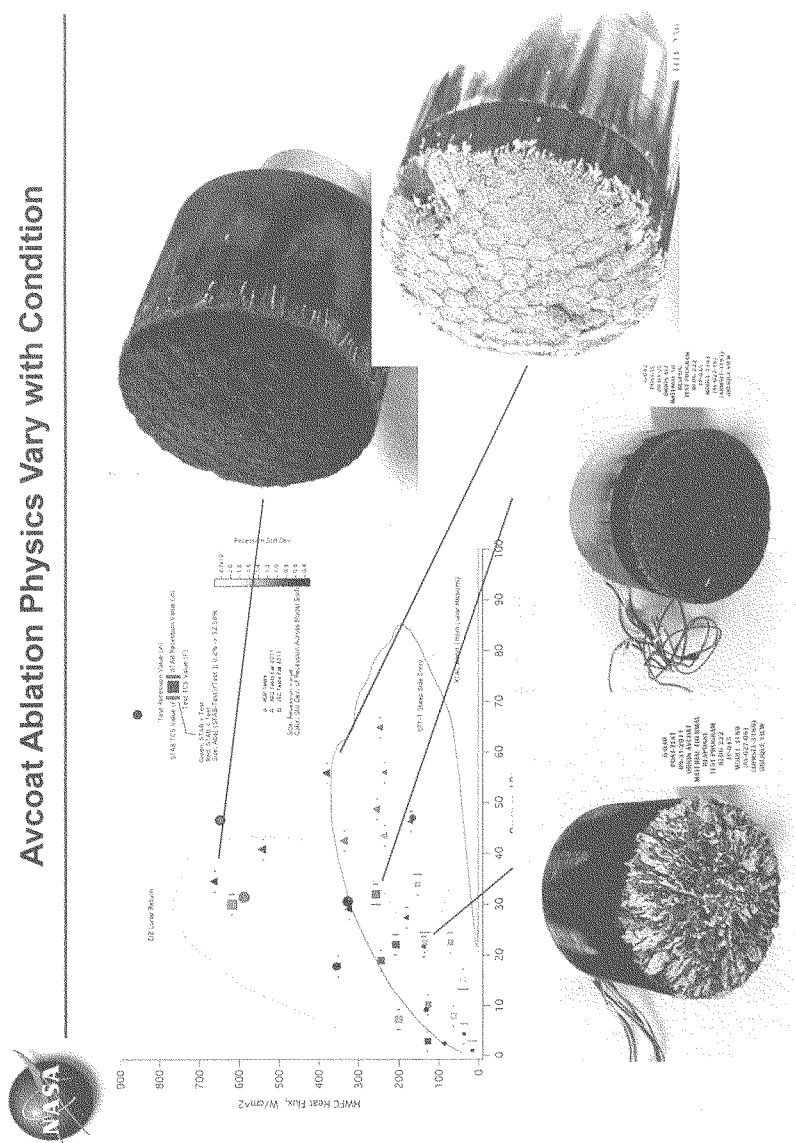


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Avcoat Arcjet Test Environments and Expected Flight Environments

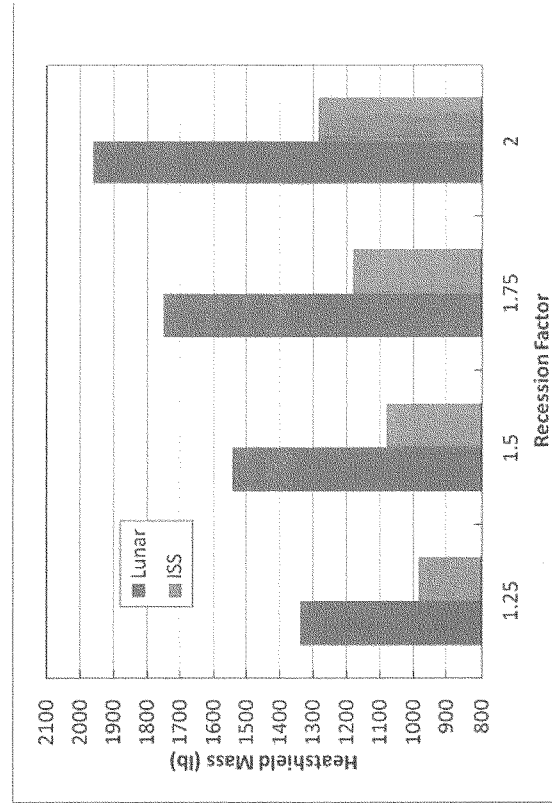


Avcoat Ablation Physics Vary with Condition





Increases in Mass due to Margin Increase





Items Needed to be Performed before JSC Arcjet Reopens

Electrical

Isolate electrical energy sources
Update TP1 Power Connect Drawing SIZ36133597
Update SOP-009.33 ARMSEF Rectifier/Load Bank System Operations
Update Master Measurement List (M.M.L) for Instrumentation
Update HA-ES-222-10MW Power Supply - Hazard Analysis for the ARMSEF Rectifier System/10MW Power Supply

Coolant System

Isolate Coolant system energy sources
Update SOP-009.29 Coolant Water System Operation
Redline Coolant System drawings ARMSEF-03-3000 Sheets 1-7
Update HA-ES-222-Coolant System - Hazard Analysis for the ARMSEF Coolant Water System
Update FMEA-ES-222-Coolant System - Failure Modes and Effects Analysis for the ARMSEF Coolant Water System

Cooling System

Isolate Cooling System energy sources
Update TP1 Cooling Water Connect Drawing ARMSEF-04-4000
Update SOP-009.30 Cooling System Operation
Update HA-ES-222 Cooling Water System ARMSEF



Items Needed to be Performed before JSC Arcjet Reopens

Data/Control System

Determine impact of removing TP-1 from current configuration to include safety interlocks, abort and warnings

- Update SOP-009.75 Test Data Acquisition System Operation
- Update ASEA Abort and Warning Configuration
- Update HA-ES-222-TDACS - Hazard Analysis for the ARMSEF Test Data Acquisition System
- Update HA-ES-222-ASEA Control System - Hazard Analysis for the ARMSEF ASEA Control System

Test Gas System

Isolate test gas energy sources

- Update SOP-009.11 Test Gas System Operation
- Update HA-ES-222-Test Gas System - Hazard Analysis for the ARMSEF Test Gas System

Vacuum Systems

Isolate Test Chamber 1 from Vacuum energy source

- Update SOP-009.31 Vacuum System Operation
- Redline drawing ARMEF-56-5600 TP1 & TP2 Vacuum System and Steam Piping Schematic
- Update HA-ES-222-Vacuum/Ejector System - Hazard Analysis for the ARMSEF Vacuum/Ejector System

Test Operations

- Update SOP-009.28 ARMSEF Test Operations
- Update TP1 Test Gas System Connect Drawing EESL-70-2080
- Update HA-ES-222-ARMSEF - Hazard Analysis for the Atmospheric Reentry Materials and Structures Evaluation Facility

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33



Items Needed to be Performed before JSC Arcjet Reopens

Rigging/Shipping/Transportation

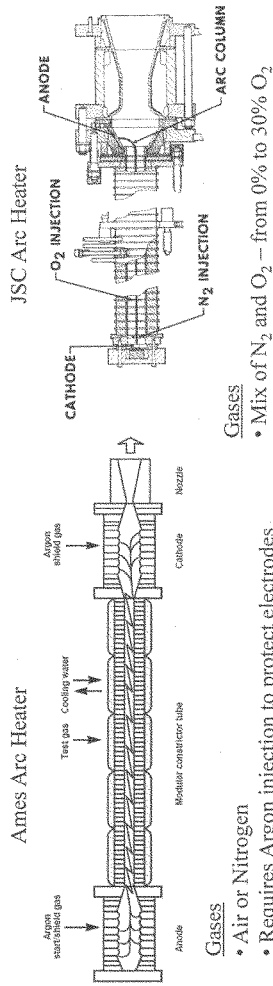
- Prepare container for shipping
- Prepare facility for removal of heater
- Perform rigging operations
- Complete 290 shipping documentation

Facility Readiness Reviews

- Configuration Control Board (CCB)
- Failure Mode and Effects Analysis
- Pressure System Risk Assessments
- Pressure Systems Compliance Review
- Class 1 Inspections
- Train & Certify on new Configuration
- Route all packages for approval
- User Readiness Review (URR)



Different Approaches to Reentry Simulation



Gases

- Air or Nitrogen
- Requires Argon injection to protect electrodes

Energy Transfer to Gas

- Ballast resistors used to divide electric arc attachment
- Copper ring electrodes

Compromises

- Argon reduces oxygen partial pressure
- Copper contamination
- Ballast resistance approach limits capability to vary current rapidly which is needed for flight heating profile simulation

Gases

- Mix of N₂ and O₂ – from 0% to 30% O₂

Energy Transfer to Gas

- Vortex stabilized electric arc
- Tungsten cathode
- Copper anode

Compromises

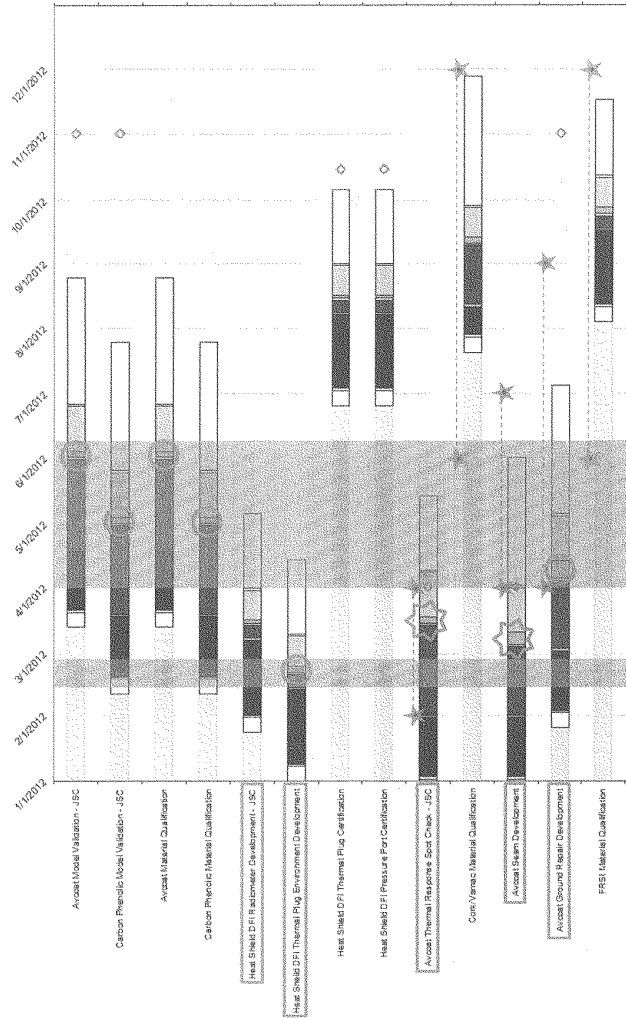
- Simulated air does not include trace gases
- Gas Injection scheme experienced based
- Copper contamination
- Power limited due to arc attachment approach

Testing Needed in Both Facilities to Evaluate Effects on Material Response.

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Impact of Work Stoppage on JSC Arcjet Testing



From 221/12 TPS ITCSR package

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From 22/12 TPS TCSR package

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Impacts of JSC Arcjet Work Stoppage on Orion Test Needs

- Near term impacts (models available, need to test prior to 10 week shutdown):
 - *Avcoat with Hexcel HC Spot Check test*
 - Needed to confirm Avcoat Thermal Performance Due to Recent Avcoat Honeycomb update from “Ultracore” to “Hexcel.” Need before engineering release (early April).
 - *HS DFI Thermal Plug Environment Development*
 - Completion of development tests needed prior to entering final design phase.
- Mid term impacts (critical testing that was planned during 10 week shutdown period):
 - *Avcoat seam & ground repair development*
 - Testing needed prior to start of EFT-1 HS Avcoat installation.
 - *HS DFI Radiometer Development*
 - Completion of development tests needed prior to entering final design phase.
- Long term impacts
 - Shutdown from April through mid-June will create a back log in the summer; it is unlikely that all of the testing can be completed in FY12.
 - Characterization of the TP1 heater performance at ARC will not be complete by Oct 1
 - Risk to the program if testing slips into FY13 and is transferred to ARC
 - Testing should be completed at JSC, per the assessment, regardless of schedule
- Wildcard impact
 - Cracked Avcoat testing
 - Critical risk to project, so could displace other tests by priority
 - Transient testing is necessary to understand expected flight behavior



AJEWG Report

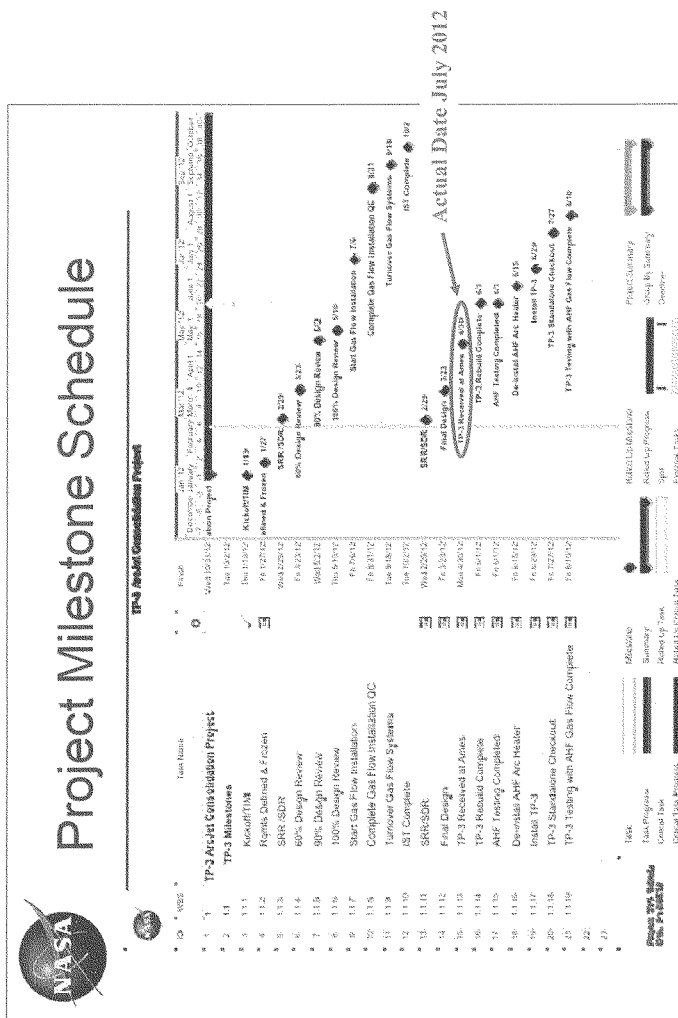
- **Major Conclusions of the “Evaluation of the NASA Arc Jet Capabilities to Support Mission Requirements”**
 - Chartered by Mike Ryschkewitsch of the Office of Chief Engineer (OCE)
 - Final report released May 2010
 - NASA has a critical and strategic need for arc jet ground test capability to meet its unique mission set, and must make its own investment to support future needs.
 - Within five years, NASA must be building a single arc jet testing complex with a robust infrastructure and capability to support thermal protection system certification for large-mass Mars entry and safe return to Earth.
 - A focused activity to define complex infrastructure requirements, establish technology enhancements and design plans, and acquire financial support and construction approval should start immediately and be scheduled to support building within the next 5 years.
 - NASA should maintain testing capability at both the Johnson and Ames arc jet complexes for the time period required to begin building the new complex. NASA should reduce current staff levels at Johnson and Ames and manage a scheduled phase-out plan that offers an efficient transition to test operation at the new complex.



More Impacts of Loss of JSC Arcjet

- Lack of Variable Test Gases
 - JSC arcjet facility has demonstrated the ability to test flexible mixtures of test gases
 - Mars test gas simulations performed with 90% CO₂/10% N₂
 - Studies performed to prove the risk of explosion for CO was not an issue, that CN would not be formed, and that there were no environmental impacts with running CO₂/N₂ mixtures
 - ARC facility would need to go perform the same studies to ensure they could safely perform CO₂/N₂ testing
 - Due to the large vacuum sphere at ARC, the buildup of CO and CN could be a significant issue preventing them from being able to test CO₂/N₂ gas mixtures
- Loss of arcjet technical expertise
 - Closure of the JSC arc-jet will result in the loss of jobs for key personnel that have been at the forefront of arc-jet testing for decades.
 - After partial loss of critical skills at JSC in 2002, it took 3 years to recover.

Project Milestone Schedule



Ex-930/2

From SRR package 2/29/12

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LETTER SUBMITTED BY REPRESENTATIVE STEPHEN STOCKMAN

September 18, 2013

The Honorable Stephen E. Stockman
 United States House of Representatives
 326 Canon House Office Building
 Washington, DC 20515

Subject: Safety and Mission Assurance concerns related to the closure of the JSC Arc Jet Facility

Dear Congressman Stockman:

NASA Headquarters (HQ) has directed the Johnson Space Center (JSC) to close the JSC arc jet facility in October 2013. It is my belief that this will destroy a vital national test capability needed to support the development and fabrication of thermal protection systems (TPS), a key element in any future space enterprise. Accordingly, I sent letters to Senators Hutchinson and Cruz, Congressmen Palazzo, Olson and Smith, NASA Headquarters and Johnson Space Center management expressing my concerns over the closure of the JSC arc jet. Therefore, the purpose of this letter is to solicit your support in overturning this NASA Headquarters directive.

NASA currently has two major arc jet facilities – NASA JSC and NASA Ames. Another small, low-power arc jet exists at NASA LaRC and is used for preliminary material screening. Arc jets are the primary facility used to develop and certify thermal protection materials and systems for reentry spacecraft. Both the JSC and Ames facilities, and a facility at LaRC, were used for Apollo and Space Shuttle Orbiter TPS development and certification. For example, the Apollo program performed 8000 arc jet tests on the TPS and tested in approximately 15 separate arc jet facilities. The Orbiter TPS was basically certified thru testing in the NASA JSC and Ames arc jet facilities. This testing provided an independent, verification of the Apollo, Orbiter TPS material performance. However, arc jet testing to support real time flight anomalies is also sometimes required. The Columbia accident required the use of the JSC arc jet facility to establish damage threshold conditions for the Orbiter tile and reinforced carbon-carbon (RCC) TPS. In addition, if we had an occasion to repair either RCC or tile with the available repair system, an arc jet test of the repaired area would be required to provide the confidence needed to re-entry.

The closure of the JSC Arc Jet facility raises far too many concerns about TPS development, safety, and mission assurance (S&MA), not to mention the process NASA Headquarters is following. NASA Headquarters is ignoring their experts, as well as the independent experts and many other reports and assessments on the subject. The NASA Chief Engineer assigned the NASA Engineering and Safety Center (NESC) an action to assess the impact of closure of the JSC facility and results of this study are documented in NESC report NESC-RP-12-00790 (ITAR-Restricted), “Impact of NASA Arc Jet Consolidation on the Multi-Purpose Crew Vehicle (MPCV) Program and TPS Margins,” dated November 12, 2012. As a result of this assessment, the NESC concluded that the JSC and Ames Research Center (ARC) arc jet test complexes have differing performance characteristics. Tests on ablative materials at similar conditions produced different results in the JSC and ARC arc jet complexes. Although potential causes were identified, the individual effects and combined interactions of these differences are not fully understood. Risks associated with only one arc jet complex are discussed on pages 73-74 of the NESC report. February 1, 2012 the National Research Council (NRC) released its “Space Technologies Roadmap and Priorities” report in which it outlined the most critical technological requirements for future space exploration. Out of the hundreds of technologies considered,

Thermal Management Systems (TMS) was selected by the NRC as a high priority technology and deemed "mission critical for all human and robotic missions that require planetary entry or reentry." The report noted that "having multiple facilities spreads out the risk, while also allowing different physics to be investigated at different locations."

On March 8, 2012, NASA S&MA engineers presented to the S&MA Technical Review Board and made the following recommendations and justifications relative to TPS S&M: maintain the JSC arc jet facility in a fully operational state to ensure complementary test capabilities to the ARC facility (capabilities needed to certify TPS) in order to maintain test capacity, ensure maximum testing scope, and to minimize the facility driven uncertainties. They also noted that independent verification is essential, which is the charter of the S&MA Directorate (independent assessment of the work of our engineering counterparts).

It is critical to remember that the arc jet test data validates the analytical models used in TPS design and flight operations. The TPS is a critical subsystem with no redundancy and interacts with the entry environment and, without an adequate understanding of the TPS performance, the result can be catastrophic. Therefore, I believe that closure of the JSC Arc Jet complex will have an adverse effect not only to future NASA space programs, but also the current commercial and defense programs.

I am a retiree from NASA JSC and have 49 years of government and industry experience in the analysis and testing of space vehicle thermal protection systems. Your investigation into this situation would be appreciated and hopefully the unwise decision to close the JSC Arc Jet facility can be reversed.

Thank you for your time and support. Please feel free to contact me if you have any questions.

Donald M. Curry, PH.D., P.E.
2610 Rip Van Winkle Dr.
Pearland, Texas 77581-6414
281-485-2873
dncurry1@att.net

BACKGROUND

Technical

- Thermal Protection System Design and Analysis
- Space Shuttle Orbiter LESS/RCC NASA Systems Engineer

Education

- Bachelor of Science in Mechanical Engineering, University of Oklahoma, 1958
- Master of Science in Mechanical Engineering, University of Pittsburgh, 1962
- Doctor of Philosophy in Mechanical Engineering, University of Houston, 1970

Background

- Employed at Bettis Atomic Power Laboratory, Westinghouse Electric Corp., January 1958-June 1962
- Employed at General Dynamics Corporation, June 1962 - June 1963
- Employee of NASA Johnson Space Center, June 1963 to January 2007

NASA Work Experience

- Joined the NASA Johnson Space Craft Center (JSC) in June, 1963 and has approximately 44 years of experience in the areas of entry heating and thermal protection systems starting with the Gemini spacecraft thru the Space Shuttle.
- Subsystem manager of the Space Shuttle Orbiter Leading Edge Structural Subsystem (LESS) which consists of reinforced carbon-carbon (RCC) wing leading edge panels, nose cap, chin panel and forward external plate attachment. Responsible for the direction, coordination, technical design, development, testing, analysis, certification, spacecraft installation, and flight operational support.
- JSC Aeroassist Flight Experiment (AFE) Project Area Manager with the responsibility for the direction, coordination and technical expertise for the design, development, testing, analysis, certification, fabrication, installation, flight support, and NASA intracenter efforts for the AFE aerobrake structure and thermal protection system.
- Participated in the Orbiter return-to-flight program as the Orbiter LESS/RCC NASA Systems Engineer responsible for insight and oversight of contractor activities pertaining to the operation and maintenance of the Orbiter LESS.
- Served as technical lead for evaluation of hot structure and ablators for advanced NASA programs.

Post-NASA Work Experience

- TPS Consultant with Valador (TPSpirits/Orion Project) and Boeing Company (Space Shuttle Orbiter/Commercial Crew Program) February 2007 – Present
- National Research Council, “NASA Space Technology, Roadmaps and Priorities,” Materials Panel, 2011
- NASA Engineering and Safety Center, “Impact of NASA Arc Jet Complex Consolidation on the MPCV Program and TPS Margins,” Subject Matter Expert, Ablative TPS, Arc Jet Testing, 2012

Honors and Awards

- Lyndon B. Johnson Space Center Certificate of Commendation in recognition of his outstanding leadership, achievements and technical contributions in the development of reinforced carbon-carbon hot structure thermal protections for the Orbiter and advanced programs, December, 1998
- Silver Snoopy Award for professionalism, dedication and outstanding support that greatly enhanced space flight safety. Astronauts Personal Achievement Award, December, 2003
- NASA Exceptional Achievement Medal in recognition of his outstanding application of reinforced carbon-carbon expertise to the STS-107 Columbia mishap investigation, associated testing and return-to-flight activities, August, 2004
- One NASA Peer Award for his life-long dedication to achieving NASA’s mission through cooperative efforts benefiting the agency, April, 2006
- NASA Exceptional Achievement Medal in recognition of his outstanding application of reinforced carbon-carbon expertise to the STS-107 Columbia mishap investigation, associated testing and return-to-flight activities, April, 2006
- Numerous NASA Group Achievement Awards

Publications

Published over 80 papers as NASA documents, AIAA and ASME papers

LETTER SUBMITTED BY REPRESENTATIVE STEPHEN STOCKMAN

Donald Tillian
925 Crestmoor Drive
Allen, Texas 75013
214-383-0816
TillianDonald@att.net

September 17, 2013

The Honorable Stephen E. Stockman
United States House of Representatives
326 Cannon House Office Bldg.
Washington, D. C. 20515-4336

Subject: Update on Closure of the JSC Arc Jet Facility and National Security Concerns

Dear Representative Stockman:

In view of the upcoming hearing on the NASA Infrastructure Enabling Discovery and Ensuring Capability, I wanted to update you on the closure plans for the JSC Arc Jet Facility and my concerns. The facility is currently slated for closure in October 2013 after completion of tests for the Boeing Commercial Venture and Orion Thermal Protection System tests. However, other commercial space enterprise companies wanted to test in the JSC Arc Jet Facility but were not allowed to do so since their test programs would take place after the NASA mandated closure and completion of the current scheduled tests.

Obtaining comparable test results in the same facility would be the sensible way to do the required testing by other commercial enterprise companies. Also, technical issues have recently occurred with the NASA Orion Thermal Protection System Material. This will require arc jet testing to resolve the problem. This type of testing should be performed at JSC in view of its past history in resolving these types of technical issues on manned spacecraft programs.

As you know the current NASA plan is to consolidate all arc jet testing at the NASA Ames Research Center. However, the JSC facility is needed now and in the future to support the materials development, analyses, design, and certification of the current Orion Thermal Protection System and new initiatives by commercial enterprises. This facility will also be needed in the event of vendor changes and materials will require recertification. In the event of flight damage during the mission, the JSC arc jet will be required to support real time resolution of any thermal protection system anomaly as well as post flight investigations.

During the past year, a letter signed by 30 members of the House of Representatives (both sides of the aisle) had been sent to NASA Headquarters raising issues about this pending NASA action. This letter dated 2/24/12 went out of Congressman Pete Olsen's

office. The response to this letter as well as other communication with NASA HDQTS during the past year has been less than satisfactory and NASA is continuing on this unwise course of action. In the past, the JSC arc jet facility also supported testing of heat shield systems for the Atomic Energy Commission, the United States Navy, other national security agencies as well as heat shield development activities for the NASA Langley Research Center.

It does not make much sense to dismantle the equipment at JSC, destroy an outstanding test capability and a dedicated, highly technically competent, test team with a “can do attitude”, and take the national security risks, and single point failure associated with only one arc jet facility in the NASA agency in these uncertain times. The other issue relates to safety. Safety organizations have expressed concerns concerning the ability of the Ames Arc jet Facilities to match the JSC capability, the flow field stream diagnostics, and also the issue related to a single point failure with only one NASA arc jet facility.

There have been multiple independent review teams that have addressed the JSC arc jet closure issue with findings that NASA HDQTS has ignored.

In Sept. 2008, a Constellation Independent Review Team chaired by Charlie Mallini, concluded that both the Ames and JSC Arc Jet Facilities were needed to support certification and verification of thermal protection systems for super-orbital high velocity entry environments.

In May 2010, the AJEWG (ARC-Jet-Evaluation Working Group) released their report that recognized the critical need for arc-jets and recommended that both the Ames and JSC facilities remain open until another new arc-jet complex was built in the future.

In March ,2012 Safety briefings prepared by the NASA Office of Safety & Mission Assurance identified significant issues with the closure of the JSC Arc Jet Facility including loss of test capability reduction in test capacity, differences in the facility infrastructure including test chamber, diffusers pressure capability, model sizes, and critical flow diagnostic capability,

Most important from a safety perspective would be the concern that consolidation of arc jet testing at Ames would result in a single point failure in the event of equipment malfunction and national disasters.

The NASA Engineering and Safety Center (NESC) recently undertook a study to assess the differences in test results from multiple arc jet facilities and risks associated with only one arc jet facility. The results were reported in an ITAR Restricted Report NESC-RP-12-00790 dated November 29, 2012

In essence, all of these studies by NASA’s own high level technical and safety experts have the same conclusions- loss of a critical NASA and national test capability,

and impact to schedule and mission assurance for the current NASA missions and commercial enterprises space flight programs.

Closure of the JSC Arc Jet Facility will result in the loss of a major test capability that is required to develop high temperature entry heating protection systems, destroy the critical test infrastructure that is needed by NASA and Commercial Enterprises for now and the for seeable future and adversely affect our nations national security.

I would appreciate your further investigation with your colleagues into this situation. Hopefully the unwise decision by NASA Headquarters to close the JSC facility can be reversed so our nation will not suffer any long term adverse consequences.

Thank you for your time and support. I am a retiree from NASA JSC, lived in the NASA JSC Clear Lake area, now live in Allen in North Texas, and have extensive experience in the testing and evaluation of missile and space vehicle thermal protection systems. I am including a summary of my background. Please feel free to contact me if you have any questions.

Donald Tillian
925 Crestmoor Drive
Allen, Texas 75013-5361
214-383-0816
tilliandonald@att.net

BACKGROUND

EDUCATION

New Mexico State University
B. S. Chemical Engineering 1958
Worked part time in co-op program at White Sands Proving Ground
University of Houston-Clear Lake
B.S. Physical Science 1985

EXPERIENCE

Douglas Aircraft-Santa Monica CA 1958-1961
Materials & Process Engineer
Process engineer responsible for control of material processes used in the manufacture of commercial aircraft and missile systems- Thor Intermediate Range Ballistic Missile, Nike Hercules & Zeus, Skybolt
Test engineer in the Douglas Arc Jet Facility – missile heat shield material tests

Ling Temco Vought-Grand Prairie, TX ----1961-1964

Materials Test Engineer- Group Engineer responsible for operation of LTV Arc Jet
Facility evaluation of heat shield materials –air force and in-house studies

NASA JSC, Houston, Texas ----1964-1997

Test Engineer/Director JSC Arc Jet Facility

Orbiter TPS Test Program Manager

Section Head- JSC Arc Jet Facility

Branch Chief- Test Branch-(Structures Test Lab, Acoustic and Vibration Test Facility,
JSC Arc Jet Facility, Radiant Heat Test Facility)

Shuttle Return to Flight 2003-2011

Boeing KSC- Mid-Life Cert- Return to Flight-team member/consultant

Boeing Houston- Return to Flight team member/consultant-Damaged TPS Testing, TPS
Repairs Testing in JSC Arc Jet Facility.

PUBLICATIONS

Published numerous test memorandums, formal test reports, conference papers, and
articles in scientific journals.

DOCUMENT SUBMITTED BY REPRESENTATIVE STEPHEN STOCKMAN

National Aeronautics and Space Administration
Ames Research Center
Moffett Field, California 94035-1000

Justification for Other than Full and Open Competition

[FAR 6.303-2(b)(1)]

Summary Information:

Initiating Office: NASA Ames Research Center
Aerothermodynamics Branch (TSA)

Purchase Request No.: 4200442015

Procurement Title: ARC Jet Facility Characterization Test at Centro Italiano Ricerche
Aerospaziali (CIRA) Scirocco Plasma Wind Tunnel

Total Estimated Value: FOIA Ex. 5

Period of Performance: 18 Sep 2012 – 17 Sep 2013

Statutory Authority: 10 USC 2304(c)(1), *Only One Responsible Source and No Other
[FAR 6.303-2(b)(4)] Supplies or Services Will Satisfy Agency Requirements*

This Justification for other than full and open competition has been prepared in accordance with the requirements of Federal Acquisition Regulation (FAR) 6.303 and NASA FAR Supplement (NFS) 1806.303.

Detailed Information:

A. Nature and/or description of the action being approved. [FAR 6.303-2(b)(2)]

NASA Ames Research Center (ARC) proposes to negotiate a sole source one year Firm Fixed Priced contract with Centro Italiano Ricerche Aerospaziali (CIRA) for the performance of a series of characterization tests in their large scale, state-of-the-art Scirocco arc jet facility. The results of the characterization tests will allow NASA to evaluate Scirocco's performance at operating conditions that are beyond NASA's present capability and to acquire insight into the advanced designs for Scirocco's plant infrastructure (flow path, power, cooling, and control). NASA will use the data and experience to reduce technical risks of NASA's own arc jet facility expansion efforts.

NASA currently conducts atmospheric entry heating tests of spacecraft heat shield materials at ARC and JSC. Heat shield technology development for future NASA-led exploration missions, such as Mars sample return, will require testing at conditions beyond the reach of NASA's facilities which date from the 1960s and 1970s. As a first step towards expanding NASA's arc jet test capabilities, the Scirocco facility characterization tests will provide NASA with insight into the advanced features of the CIRA's facility and valuable performance data over a wide range of conditions that are outside NASA's ability to achieve. NASA will use the data and experience to reduce technical risks of NASA's own arc jet facility expansion efforts needed to meet the test requirements for decades to come. In the end, the results will enable new heat shield material design and development approaches – at lower risk- for future missions by expansion of critical validation testing into more demanding entry heating environments.

B. Description of the supplies or services required to meet the agency's needs (including estimated value). [FAR 6.303-2(b)(3)]

NASA will obtain the following required services from CIRA:

- **Facility Background Information** CIRA shall deliver dimensioned drawings and schematics of Scirocco's plenum, 1150 mm exit dia. nozzle, test chamber, and diffuser. These will be used by NASA to simulate CIRA's operation for pre-test planning and post-test data analysis purposes.
- **Facility Characterization Test** CIRA shall conduct a two-phase facility characterization test in Scirocco. The first phase will demonstrate operation over a series of runs at increasing arc heater pressure approaching the facility's design maximum arc pressure of 16.7 bar. The second phase will demonstrate operation over a series of runs at increasing arc current approaching the facility's design maximum enthalpy of 45 MJ/kg.
- **Facility Test History Summary** CIRA shall provide a summary of all previous tests in Scirocco.

The cost of approximately \$325,000 was estimated in response to prior discussions about the scope of the proposed activity and the number of days of occupancy in the Scirocco facility.

C. An identification of the statutory authority permitting other than full and open competition. [FAR 6.303-2(b)(4)]

The statutory authority for this procurement is 10 USC 2304(c)(1), *Only One Responsible Source and No Other Supplies or Services Will Satisfy Agency Requirements*.

D. Demonstration of the proposed contractor's unique qualification or the nature of the acquisition requires use of the authority cited. [FAR 6.303-2(b)(5)]

In accordance FAR 6.302-1(a)(2), "When the supplies or services required by the agency are available from only one responsible source, or, for DoD, NASA, and the Coast Guard, from only one or a limited number of responsible sources, and no other type of supplies or services will satisfy agency requirements, full and open competition need not be provided for."

Further, in accordance with FAR 6.302-1(b), "Use of this authority may be appropriate . . . [w]hen there is a reasonable basis to conclude that the agency's minimum needs can only be satisfied by . . . unique supplies or services available from only one or a limited number of sources or from only one or a limited number of suppliers with unique capabilities."

Large scale arc jet facilities are used for testing and evaluation of spacecraft heat shield materials that protect a spacecraft during entry into a planetary atmosphere. There are very few of these facilities operating in the world, including NASA's facilities. NASA seeks information from CIRA about the design, operation, and performance characteristics of facilities with operational capabilities that exceed those of NASA's aging arc jet facilities. NASA will use the information acquired from CIRA through this contract to develop strategies for upgrading and expanding NASA's arc jet facilities.

The Scirocco arc jet test facility is unique in the world. Completed in 2001, Scirocco is also the most modern of the world's large-scale arc jet facilities. Scirocco has advanced designs for the supporting subsystems (listed in the SOW and Test Plan) and is the only arc jet facility capable of operating at arc pressures as high as 16.7 bar and enthalpies as high as 45 MJ/kg. NASA's own facilities at ARC and JSC and the Boeing LCAT facility cannot match CIRA's extreme operating conditions. These conditions are necessary to evaluate heat shield materials for atmospheric entry vehicles returning from Mars or other deep-space destinations, which are part of NASA's long-term plan.

E. Description of efforts made to ensure that offers are solicited from as many potential sources as is practicable, including whether a notice was or will be publicized as required by FAR Subpart 5.2 and, if not, which exception under 5.202 applies. [FAR 6.303-2(b)(6)]

A synopsis was posted on 28 June 2012 on the NASA Acquisition Internet Service (NAIS) and the Federal Business Opportunities Portal (FedBizOpps) to inform the public and industry of NASA's intent to contract with CIRA. The synopsis closed on 13 July 2012; no responses were received as a result of the synopsis.

F. A determination by the Contracting Officer that the anticipated cost to the Government will be fair and reasonable. [FAR 6.303-2(b)(7)]

The Contracting Officer's signature on this document indicates that the Contracting Officer has determined that the anticipated cost to the Government will be fair and reasonable. CIRA will be requested to submit a proposal for the firm fixed price of the test services. Prior to execution of the contractual instrument, a proposal analysis will be performed in accordance with FAR 15.404. Proposal analysis will include cost and price evaluation techniques to ensure the final negotiated price is fair and reasonable.

G. Description of the market research conducted and the results or a statement of the reason market research was not conducted. [FAR 6.303-2(b)(8)]

A synopsis (NAA12ARCJET) was posted on 28 June 2012 on NAIS and FedBizOpps as stated in paragraph E, above. The synopsis closed on 13 July 2012; no responses were received as a result of the synopsis.

The Project Lead and COTR have extensive knowledge of the capability of large-scale arc jet facilities. They have determined that large-scale arc jet facilities, in or accessible to the U.S., are few in number. Worldwide, CIRA's Scirocco in Italy, NASA's facilities at ARC and JSC, and Boeing's LCAT facility are used for test and evaluation of atmospheric entry heat shield materials at the scale and flow conditions necessary for flight qualification. Each of these large scale facilities represents a significant capital investment for a limited user base – primarily national governments. No institution, private or public, other than CIRA's Scirocco has a large scale arc jet facility that can be used for this type of heat shield material testing. Of the existing, accessible facilities, only CIRA's Scirocco meets NASA's requirements for operating at conditions exceeding those of all other known, accessible facilities.

H. Any other facts supporting the use of other than full and open competition. [FAR 6.303-2(b)(9)]

The Project Lead and COTR have determined that only CIRA's Scirocco facility meets NASA's requirements for operating at conditions exceeding those of all other known accessible facilities and is highly qualified to provide the required test services.

A detailed description of Scirocco and its capabilities compared to other arc jet facilities can be found in the following reference:

G. Russo, F. De Filippis, S. Borelli, M. Marini and S. Carista, "The Scirocco 70-MW Plasma Wind Tunnel: A New Hypersonic Capability," in *Advanced Hypersonic Test Facilities*, American Institute of Aeronautics and Astronautics, F.K. Lu and D.E. Marren, eds. (2002).

I. Listing of the sources, if any, that expressed, in writing, an interest in the acquisition. [FAR 6.303-2(b)(10)]

See paragraph E. No sources, other than CIRA's Scirocco, have expressed an interest in the acquisition.

J. Statement of the actions, if any, the agency may take to remove or overcome any barriers to competition before any subsequent acquisition for the supplies or services required. [FAR 6.303-2(b)(11)]

It is the intent of NASA to develop advanced capability within the agency to support future requirements for this testing. The information received as a result of this contract will facilitate NASA's effort to develop this capability.

Signature Page

Requirement Initiator:
Jay Grinstead
Aerospace Engineer

I certify that the facts presented in this justification are accurate and complete.

 Signature

 Date

Contracting Officer:
Manuel Herrada

I hereby determine that the anticipated cost to the Government will be fair and reasonable and certify that this justification is accurate and complete to the best of my knowledge and belief. (FAR 6.303-2(b)(12))

 Signature

 Date

cc (after approval):
 JAC Admin Asst: 241-1



LETTER SUBMITTED BY REPRESENTATIVE BILL POSEY

Congress of the United States
Washington, DC 20515

September 16, 2013

The Honorable Charles Bolden
Administrator
National Aeronautics and Space Administration
300 E Street
Washington, DC 20546

Dear Administrator Bolden:

We write to voice our continued support of NASA's ongoing effort to quickly and efficiently lease their costly, excess space launch infrastructure and other assets for commercial use, consistent with the mandates of 51 USC § 50913, Acquiring United States Government Property and Services, as well as in recommendations made by the NASA Office of Inspector General (OIG) in their February, 2013 report, "NASA's Efforts To Reduce Unneeded Infrastructure and Facilities" (Report No. IG-13-008)

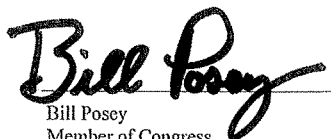
Two decades ago, the United States was the world leader in commercial launches. Today, that has virtually disappeared. However there are American space launch companies that are committed to changing that. The termination of the Space Shuttle program has resulted in significant job loss in Florida. There is also considerable launch infrastructure on the Space Coast that could and should be made available to commercial companies so that we can build a robust space launch business along Florida's Space Coast. We have an opportunity to recapture the commercial space launch business, but unnecessary delays could hamper our ability to do that. We strongly encourage NASA to continue to work with private industry to find ways to use excess NASA infrastructure to recapture this industry.

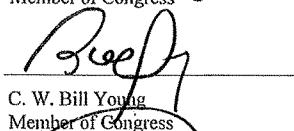
In particular, we commend NASA for undertaking an open, competitive process regarding Launch Complex 39, Pad A, (LC-39A) at the Kennedy Space Center (KSC). As you are aware, the NASA Inspector General and the Agency have identified LC-39A as excess infrastructure and have no "future mission-related uses for these facilities" (Report No. IG-13-008). Consistent with the OIG's recommendation, as well as the need to reduce overhead in the current constrained fiscal environment, we understand that NASA is currently undertaking an open competitive process to transfer LC-39A to a private entity, with formal decisions relating to lease terms and duration to be determined through proper negotiation subsequent to award. Given KSC's expertise, it should be within their purview and judgment to determine what factors to consider and outcomes to render. We urge you to proceed with these plans.

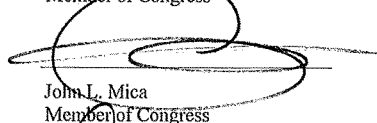
We note that NASA and KSC have been engaged in public discussions including Requests for Information and Notices of Availability, in addition to the current solicitation, centered on potential future uses of LC-39A since as early as 2009. These efforts have now culminated in this openly-competed source selection process, and KSC should apply its expertise to determine the best outcome. We commend NASA for undertaking this competition and we believe a timely decision is in our national interest.

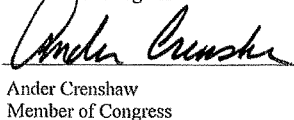
Thank you for your prompt attention in this matter.

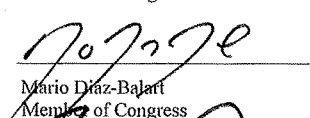
Sincerely,

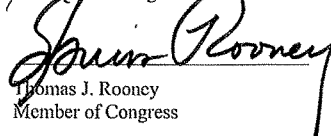

Bill Posey
Member of Congress

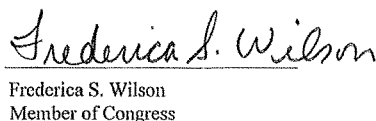

C. W. Bill Young
Member of Congress

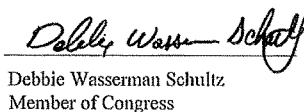

John L. Mica
Member of Congress

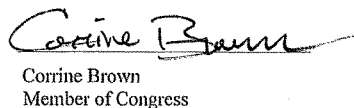

Ander Crenshaw
Member of Congress

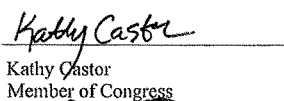

Mario Diaz-Balart
Member of Congress

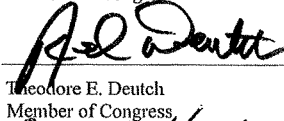

Thomas J. Rooney
Member of Congress

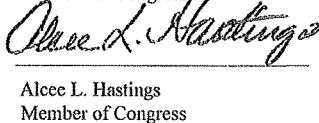

Frederica S. Wilson
Member of Congress

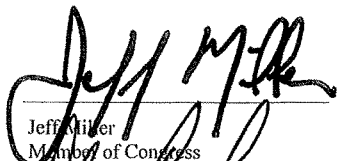

Debbie Wasserman Schultz
Member of Congress

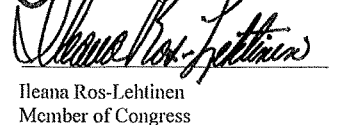

Corrine Brown
Member of Congress

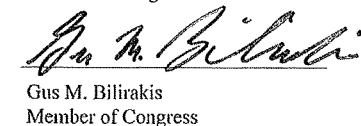

Kathy Castor
Member of Congress

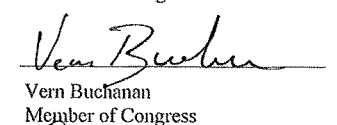

Theodore E. Deutch
Member of Congress

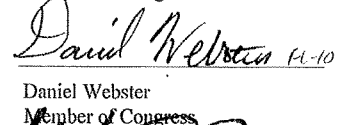

Alcee L. Hastings
Member of Congress

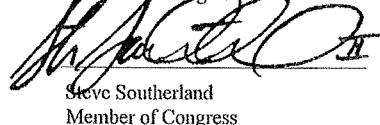

Jeff Miller
Member of Congress

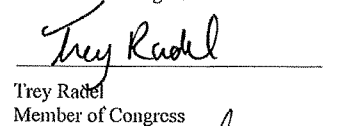

Ilana Ros-Lehtinen
Member of Congress

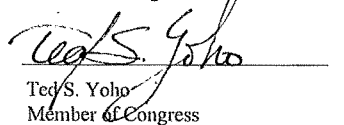

Gus M. Bilirakis
Member of Congress

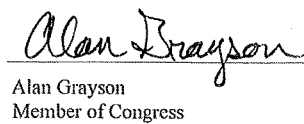

Vern Buchanan
Member of Congress

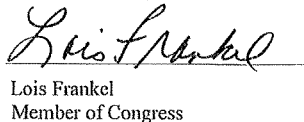

Daniel Webster FL-10
Member of Congress

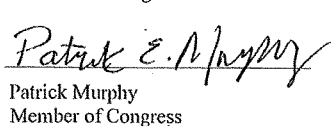

Steve Southerland
Member of Congress

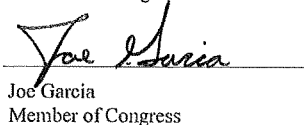

Trey Radel
Member of Congress

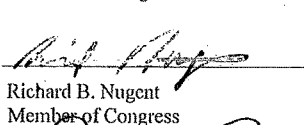

Ted S. Yoho
Member of Congress

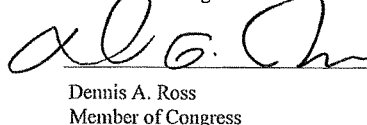

Alan Grayson
Member of Congress

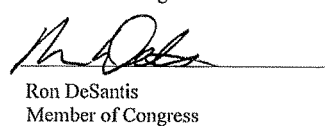

Lois Frankel
Member of Congress


Patrick E. Murphy
Member of Congress


Joe Garcia
Member of Congress


Richard B. Nugent
Member of Congress


Dennis A. Ross
Member of Congress


Ron DeSantis
Member of Congress

LETTER SUBMITTED BY REPRESENTATIVE BILL POSEY

United States Senate

WASHINGTON, DC 20510

September 13, 2013

The Honorable Charles F. Bolden, Jr.
Administrator
National Aeronautics and Space Administration
300 E Street, SW
Washington, DC 20546

Dear Administrator Bolden:

We are writing to express support for NASA's ongoing efforts to grant partner access to its facilities and equipment not fully utilized by NASA's current missions. These efforts are consistent with Congressional direction (e.g., P.L. 110-422 and 111-267), help reduce government operations and maintenance costs, and support the agency's overall mission, national space policy objectives, and national and regional economic development. We strongly encourage NASA to continue the unbiased, transparent, and competitive implementation of these efforts.


Given the importance of this issue in the face of constrained resources, we have closely monitored NASA's process for leasing these assets. Underutilized infrastructure is an agency-wide challenge recognized by Congress, the U.S. Government Accountability Office, and the NASA Office of the Inspector General. Congress has granted, expanded, and affirmed NASA's leasing authorities necessary to address these challenges, such as providing and expanding enhanced use lease authority in 2003 (P.L. 108-7), 2008 (P.L. 110-161), and 2011 (P.L. 112-55). In advance of the Space Shuttle retirement, the NASA Authorization Act of 2010 (P.L. 111-267) further directed the Agency "to evolve toward the most efficient retention, sizing, and distribution of facilities, laboratories, test capabilities, and other infrastructure consistent with NASA's missions and mandates."

We therefore applaud the agency's work to identify other users for facilities, including the Vehicle Assembly Building, the Orbiter Processing Facilities, Launch Pads 39A and B, the Shuttle Landing Facility, and many others. As you know, NASA commenced this work early in 2010 with a process that has evolved to fairly select between a range of interested parties. The steps taken have been consistent with legislative mandates to encourage the commercial use of space (51 U.S.C. 20112) and to promote the acquisition of excess launch facilities (51 U.S.C. 50913).

We support NASA's efforts to make the best use of its valuable infrastructure, as driven by the agency's current and future mission needs. NASA should apply its extensive expertise in this area and not yield to outside influence when determining what factors to consider in choosing partners to ensure that its selection process yields the best outcome for our nation's space program. We look forward to timely decisions to that end.

Sincerely,


Senator Bill Nelson


Senator Marco Rubio